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OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

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**MEMORANDUM**

SUBJECT: Ecological Risk Assessment for the Section 3 New Use Registration of Myclobutanil for use on Grass Grown for Seed, Grass Pastures, Rangeland, and Sod Farms

TO: Cynthia Giles-Parker, Branch Chief
Fungicide Branch
Registration Division (7505P)

THROUGH: Rosanna Louie-Juzwiak, RAPL 1/29/2013
Dana Spatz, Branch Chief 1/29/2013
Environmental Risk Branch III
Environmental Fate and Effects Division (7507P)

FROM: James K. Wolf, Ph.D, Environmental Scientist
Katherine R. Stebbins, Biologist 1/29/13
Environmental Risk Branch III
Environmental Fate and Effects Division (7507 P)

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# I. Executive Summary

New uses have been requested for the systemic fungicide, myclobutanil to control rusts and powdery mildew on grass grown for seed, grass pastures, rangeland, and sod farms. Myclobutanil (alpha-butyl-alpha (4-chlorophenyl)-1H-1,2-triazole-1-propane-nitrile) is a triazole fungicide in the conazole class of fungicides (Figure 1). Myclobutanil is an inhibitor of sterol 14-demethylase, which disrupts the ergosterol biosynthesis pathway that is vital to fungal cell wall structure and function. Thus, it is classified as a demethylation inhibitor (DMI) fungicide.

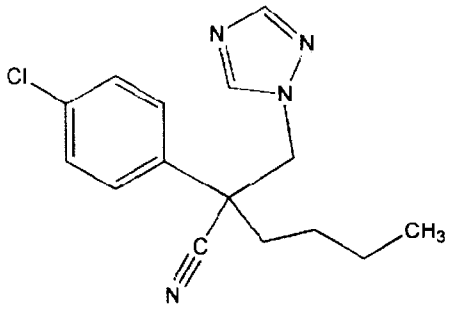


**Figure 1. Chemical Structure of Myclobutanil Active Ingredient**

The proposed application rate requested is for a seasonal max of 0.8 pounds of active ingredient per acre (lb a.i./A) per season (crop cycle) with no indication of the maximum number of crop cycles per year. For this assessment, it was assumed that the maximum seasonal application rate specified on the label was equivalent to a maximum annual application. However, in California it is reported that grass grown for sod may be cropped twice within a calendar year[1] and multiple harvests (two to three) have also been reported in Florida and Louisiana[2]. To address the potential risk from multiple crop cycles occurring in the same year, additional analysis was conducted to include scenarios based on two and three crops per year and the results are discussed in the risk description section of this document.

## A. Conclusions—Exposure Characterization

Myclobutanil is stable to hydrolysis and to photolysis. Myclobutanil degradation is controlled by microbial-mediated transformations. Myclobutanil was moderately persistent to persistent ($DT_{50}$ > 70 days) in aerobic soils and persistent in anaerobic soils. The major degradation products observed in the aerobic soil metabolism (ASM) studies were 1,2,4-triazole (maximum 18%), $CO_2$, a polar degradate (β-4-chlorophenyl-β-cyano-γ-(1H-1,2,4-triazole)-butyric acid; (maximum 9 %), and unextractable residues. At the conclusion of the 367 day ASM study, 29 to 33 percent of the applied radioactivity remained as parent myclobutanil and 13 percent was identified as 1,2,4-triazole. The sorption coefficient ($K_{ads}$) of myclobutanil ranged from 1.5 to 9.8 mL/g and for 1,2,4-triazole the sorption coefficient ranged from 0.19 to 3.35 mL/g. Sorption was not strongly correlated with soil organic carbon.

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[1] U.S.EPA, 2007. Maximum Number of Crop Cycles Per Year in California for Methomyl Use Sites. February 28, 2007.

[2] Koske, TJ. 2008. Sod Production in Louisiana. School of Plant, Environmental and Soil Sciences. Publication # 2904. Louisiana Agricultural Experiment Station, http://www.lsuagcenter.com/NR/rdonlyres/A8A8030E-79D7-413B-AD1C-CB1A3946C6BF/44947/pub2904SodProductionHIGHRES.pdf

Due to its persistence and mobility, the primary routes of dissipation are through leaching, runoff, and spray drift. Although volatilization, based on vapor pressure and Henry's Law Constant, is not expected to be a major dissipation pathway for myclobutanil, it has been detected in rain in several agricultural watersheds in California (Vogel *et al.*, 2008[3]). The degradate 1,2,4-triazole along with its conjugates (Triazole alanine and Triazole acetic acid) are common metabolites of the Triazole class of compounds. Only the 1,2,4-triazole degradate was identified in the soil and water metabolism studies for myclobutanil.

Because the log $K_{ow}$s for parent and degradation products are less the bioaccumulation trigger of log Kow= 3 (log $K_{ow}$= 2.94), myclobutanil residues are not expected to bioaccumulate.

The aquatic estimated environmental concentrations (EECs) for the proposed new uses were determined for myclobutanil, 1,2,4-triazole, and myclobutanil plus 1,2,4-triazole (*i.e.*, Total Toxic Residues) with the Tier 2 PRZM/EXAMS models and for terrestrial exposure estimates, dietary and dose-based EECs were derived using the T-REX model.

## B. Conclusions—Ecological Effects Characterization

On an acute exposure basis, myclobutanil is classified as "moderately toxic" to freshwater and marine/estuarine fish, "slightly toxic" to freshwater invertebrates and "highly toxic" to estuarine/marine invertebrates. On a chronic exposure basis, the reported NOAEC for freshwater fish was 0.98 mg a.i./L based on a 9.7% reduction in body length at 2.2 mg a.i./L. Data are not available to assess chronic risk to freshwater invertebrates. For marine/estuarine invertebrates, there were no effects to mysid shrimp (*Americamysis bahia*) tested up though 0.0856 mg a.i./L (NOAEC= 0.0856 mg a.i./L). For aquatic plants, the $EC_{50}$ for green algae was 0.83 mg a.i./L with a NOAEC of 0.56 mg a.i./L based on a reduction in cell density. Data are not available for aquatic vascular plants.

For terrestrial animals, myclobutanil is classified as "slightly toxic" to birds, both on the acute oral and subacute dietary basis. No effects were observed in the avian reproduction studies; however, the highest concentration level tested was not a particularly high concentration level for this type of study. In mammals, myclobutanil is also classified as "slightly toxic" on an acute exposure basis. Reproductive effects were observed in the mammalian reproduction study (increases in testicular, epididymal and prostatic atrophy, a slight increase in the number of stillborns and a decrease in pup body weight gain during lactation). Supplemental data on honey bees exposed to myclobutanil dust by contact suggest that myclobutanil may not be toxic to honey bees. Data are not available for terrestrial plants.

## C. Risk Summary

The results of this screening-level assessment indicate a potential for direct adverse effects to listed and non-listed birds following acute exposure (exceeds the listed species and acute restricted use LOCs) and listed and non-listed mammals following chronic exposure for the proposed new use. For estuarine/marine invertebrates, with an RQ value of 0.05, the listed species LOC, was exceeded on an acute exposure basis. Additionally, due to a lack of data, risk to aquatic (vascular and non-vascular) and terrestrial plants is assumed (See Data Gaps and Uncertainties). Due to the potential for direct adverse effects to animal and plant species associated with the application of myclobutanil on the

[3] Vogel, J.R., M.S. Majewski, and P.D. Capel., 2008. Pesticides in Rain in Four Agricultural Watersheds in the United States. J. Env. Qual. 37:1101-1115

proposed use sites, indirect effects may also result as a consequence of the potential direct effects on the taxonomic groups listed above.

***Aquatic Organisms***
With no acute or chronic LOC exceedances, the risk to fish and aquatic invertebrates (freshwater) is low based on the proposed new uses (under the assumption that the maximum seasonal application rate is the same as the maximum annual application rate). For estuarine/marine invertebrates, with an RQ value of 0.05, the listed species LOC was exceeded on an acute exposure basis. Additionally, under the conditions that there are multiple growing seasons per year (either two or three-based on Florida scenario), the RQ values were slightly higher resulting in listed species LOC exceedances for estuarine/marine invertebrates on an acute exposure basis (RQ values for one, two, and three crops per year were 0.049, 0.053, and 0.067, respectively).

Due to a lack of data, risk to aquatic (vascular and non-vascular) plants is assumed (See Data Gaps and Uncertainties).

***Terrestrial Organisms***
The acute dose-based LOCs (acute restricted and listed species) were exceeded for birds in several dietary/size classes with RQs ranging from <0.01-0.42. For chronic exposure to birds, there are no LOC exceedances. Thus, the risk to birds is expected for acute exposure and low on a chronic exposure basis. For mammals there is no risk identified on an acute exposure basis, however, there are LOC exceedances for several dietary/size classes of mammals (RQs range from 0.1-3.6) based on chronic exposure. Under the conditions that there are multiple growing seasons per year (either two or three), additional T-REX modeling was done to estimate the exposures. The results show that the additional applications did not alter the risk conclusions.

Due to a lack of data, risk to terrestrial plants is assumed (See Data Gaps and Uncertainties).

## D. Data Gaps and Uncertainties

***Aquatic Plants***
There was limited data available to assess the risk to aquatic plants from exposure to myclobutanil. While the RQ values for non-vascular plants did not exceed the LOC, there is some uncertainty because they are based on data from one species *(Selenastrum capricornutum)*. Current EFED guidance indicates that risk assessments should be based on data from the most sensitive of the four nonvascular test organisms [*Pseudokirchneriella subcapitata* (formerly *Selenastrum capricornutum*), a freshwater green algae; *Anabaena flos-aquae*, a freshwater cyanobacterium; *Navicula pelliculosa*, a freshwater pinnate diatom; and *Skeletonema costatum*, an estuarine/marine centric diatom] because these species represent distinctly different taxa, habitats, and ecological/functional niches[4]. Given the lack of data on three of the four species, the uncertainty of species variability in sensitivity to toxicants, and that there would be LOC exceedances if the $EC_{50}$ was 25 times more sensitive (less than 2 orders of magnitude) than observed with the green algae *(Selenastrum capricornutum)*, risk to non-vascular aquatic plants is assumed.

Aquatic vascular plant toxicity data are not available for myclobutanil. In the absence of toxicity data for myclobutanil, data from seven other conazoles (DMI triazoles) were previously summarized in the 2009 CRLF assessment. Assuming that myclobutanil toxicity to aquatic vascular plants is similar to

[4] US EPA, 2008. Memorandum from D. Brady to OPP EFED. Clarification Regarding Aquatic Plant Risk Estimation. September 30, 2011.

other conazoles, there were no exceedences of the LOC using the $EC_{50}$ data from 6 of the 7 conazoles and the conazole mean $EC_{50}$. However, using the most sensitive a.i., resulted in an LOC exceedance (RQ value of 1.5). The surrogate toxicity data indicates the possibility of effects from myclobutanil on aquatic vascular plants that may exceed the LOC. There is also considerable uncertainty associated with extrapolating toxicity from other conazoles to myclobutanil. In the absence of data, and given the LOC exceedance with the surrogate data, risk to vascular aquatic plants is assumed.

***Terrestrial Plants***
Toxicity data are not available to assess the risk of myclobutanil to non-target plants. For myclobutanil, there were several incidents reported for terrestrial plants (See Section 4). Additionally, an analysis of 5 other DMI triazole fungicides was conducted to get a better understanding of the potential risk to non-target plants from myclobutanil (See Risk Description Section for details). Using the 5 DMI fungicides as toxicity surrogates resulted in LOC exceedances at the proposed rate for myclobutanil.

It is noted that the labeled uses of myclobutanil include direct application to a variety of terrestrial plants (agricultural and ornamental) at multiple growth stages (e.g., seed treatment, pre-bloom, bloom, foliar, post-bloom etc.), thus, it is probable that the damage to the crops is not so extensive to inhibit the use of this pesticide by applicators. Nevertheless, in the absence of data and due to the weight of the evidence from the reported incidents (see section IV) and the fact that surrogate toxicity data from similar fungicides would exceed the terrestrial plant LOCs at the proposed rate for myclobutanil (0.2 lb a.i./A), risk to non-target plants is assumed.

***Estuarine Marine Fish***
Chronic toxicity data are not available for an estuarine/marine fish. However, estuarine/marine fish were less sensitive than freshwater fish on an acute exposure basis and the calculated RQs (acute and chronic for freshwater fish and acute for estuarine/marine) are well below the EPA LOC. Therefore, in the absence of data, the freshwater fish can serve as a surrogate for chronic toxicity to an estuarine/marine fish.

# II. Problem Formulation

## A. Stressor Source and Distribution

### 1. Nature of Stressor

The proposed use of myclobutanil is for the control of rusts and powdery mildew on grass grown for seed, grass pastures, rangeland, and sod farms. The product considered in this assessment is RALLY® 40 WSP (Registration No. 62719-410), which is packaged in a water soluble packaging. The proposed applications to grass grown for seed, grass pastures, rangeland, and sod farms are as a foliar spray using aerial, ground, or chemigation equipment. The maximum single use rate is 0.2 lb a.i./A which may be applied four times every 14 days with a seasonal max of 0.8 lb a.i./A (**Table 1**). In many areas, there will only be one crop cycle per year. However, in warm climates such as Louisiana and Florida there may be more than one harvest (crop cycle) per year. Koske[5] (2008) suggests that there could be as many as three sod harvests per year. While this assessment is based on one crop cycle per year, additional analysis was conducted to include scenarios based on two and three crops per year and is discussed in the risk

[5] Koske, TJ. 2008. Sod Production in Louisiana. School of Plant, Environmental and Soil Sciences. Publication # 2904. Louisiana Agricultural Experiment Station, http://www.lsuagcenter.com/NR/rdonlyres/A8A8030E-79D7-413B-AD1C-CB1A3946C6BF/44947/pub2904SodProductionHIGHRES.pdf

description section of this document. For aquatic exposure, the parent myclobutanil, the degradate 1,2,4-triazole, and myclobutanial plus 1,2,4-triazole [*i.e.*, Total Toxic Residues (TTR)] are considered in this assessment. For terrestrial exposure, the parent myclobutanil plus the primary plant metabolite RH-9090, the 1,2,4-triazole degradate, and the triazole conjugates (triazole alanine and triazole acetic acid) are considered in this analysis.

**Table 1. Summary of Proposed Uses of Myclobutanil**

| Supplemental Product Label | Reg. No. | New Use – Crop Groups, Crops | Max Rate | Minimum Application Interval | Max Number of Applications per Season | Max Rate per Season[1] |
|---|---|---|---|---|---|---|
| Rally 40 WSP | 62719-410 | Grass grown for seed, grass pastures, rangeland, and sod farms | 0.2 lb a.i/A | 14 days | 4 | 0.8 lb a.i./A |

[1] Number of seasons per year is not defined, but is assumed to be one (with additional analysis for up to three seasons per year).

## 2. Mode of Action

Myclobutanil (Figure 1) is a triazole fungicide in the conazole class of fungicides. Myclobutanil is classified as a sterol biosynthesis inhibitor (SBI) and is further classified as a demethylation inhibitor (DMI) fungicide because it inhibits the enzyme sterol 14-demethylase, which disrupts the ergosterol biosynthesis pathway that is vital to fungal cell wall structure and function[6,7]. Myclobutanil is a Group 3 Fungicide.

## B. Environmental Fate and Ecological Toxicity

The environmental fate and toxicity of myclobutanil has been discussed in depth in previous assessments. The most recent assessment was an Effects Determination for the California Red legged frog (CRLF)[8] which was completed in 2009. Prior to the CRLF assessment, a new use assessment was conducted for fruiting vegetables (crop group 8, except tomatoes), leafy vegetables (crop subgroup 4A except spinach) and artichokes, and for disease control in tropical fruits[9]. Since the completion of those assessments, a drinking water assessment was conducted for the uses considered in this assessment[10], which included the consideration of an addition of a recently submitted environmental fate study (Anaerobic Aquatic Metabolism Study, MRID 47454401). This study is also considered in this assessment.

### 1. Environmental Fate Summary

[6] FRAC Code List-Fungicides sorted by their Mode of Action. 2012. Fungicide Resistance Action Committee. http://www.frac.info/publication/anhang/FRAC-Code-List2011-final.pdf

[7] Roberts,T and Hutson, D. (1999). Metabolic Pathways of Agrochemicals-Insecticides and Fungicides Part II. The Royal Society of Chemistry. Pg. 1012.

[8] USEPA 2009. Risks of Myclobutanil Use to Federally Threatened California Red legged Frog (*Rana aurora draytonii*). Environmental Fate and Effects Division, OPP. June 17, 2009.

[9] USEPA 2007. Section 3-New Uses on Selected Crops. Myclobutanil: PC Code 128857 (DP Barcode: D336613). October 12, 2007

[10] USEPA 2012. Drinking Water Exposure Concentrations for Proposed New Myclobutanil Uses on Grass Grown for Seed, Grass Pastures, Rangeland, and Sod Farms, (DP Barcode, D403754) Environmental Fate and Effects Division, OPP, November 20, 2012.

Myclobutanil environmental fate data are generally complete and are summarized below **(Tables 7 and 8).** Myclobutanil is expected to dissipate through leaching, runoff, spray drift, and to a lesser extent microbial mediated degradation. It is stable to hydrolysis and to photolysis. Myclobutanil degradation is controlled by microbial-mediated transformation. Myclobutanil is moderately persistent to persistent in aerobic soils ($t_{½}$> 90 days) and persistent in anaerobic soils ($t_{½}$> 365 days). The major degradation product observed in the aerobic soil metabolism studies was 1,2,4-triazole. Other degradation products were $CO_2$, β-4-chlorophenyl-β-cyano-γ-(1H-1,2,4-triazole)-butyric acid, unknown, or non-extractable residues. The myclobutanil showed very little degradation/metabolism for the total system (water/sediment) in the aerobic/anaerobic aquatic metabolism study with an average half-life of 630 days (extrapolated from a 105 day study).

Terrestrial field dissipation half-life values ranged from 92 to 292 days. The potential for accumulation in soil is possible due to the persistence, especially when there are multiple applications.

The Freundlich $K_{ads}$ values for myclobutanil ranged from 1.46 to 9.77 mL/g (**Table 7**). The average $K_{ads}$ and $K_{oc}$ values are 5.03 mL/g and 520.2 mL/$g_{oc}$, respectively. The sorption of myclobutanil is not strongly correlated ($R^2$ = 0.44) to soil organic carbon, therefore $K_{ads}$ is used for modeling.

Because log $K_{ow}$s for parent and degradation products are less than the trigger log $K_{ow}$ of 3 (log $K_{ow}$= 2.94), myclobutanil is not expected to bioaccumulate (MRID 00162541).

**Metabolites**

The major degradation products of myclobutanil observed in the aerobic soil metabolism (ASM) studies were 1,2,4-triazole (maximum 18%), $CO_2$, a polar degradate (β-4-chlorophenyl-β-cyano-γ-(1H-1,2,4-triazole)-butyric acid; maximum 9 %), and unextractable residues. At the conclusion of the 367 day ASM study, 29 to 33 percent of the applied radioactivity remained as parent myclobutanil and 13 percent was identified as 1,2,4-triazole.

1,2,4-triazole and its conjugates are common metabolites to the class of compounds known as the conazoles. Detailed information concerning the environmental fate of 1,2,4-triazole can be found in 1,2,4-Triazole, Triazole Alanine, Triazole Acetic Acid: Drinking Water Assessment in Support of Reregistration and Registration Actions for Triazole-derivative Fungicide Compounds (USEPA., 2006; D320682)[11]. The environmental fate database for 1,2,4-triazole was generally sufficient to conduct the drinking water assessment. They estimated the aerobic soil metabolism half-life as 251 days. Soil partition coefficients $K_F$ ranged between 0.7 and 0.8 mL/g.

## 2. Ecological Toxicity Summary

Available toxicity data have been discussed in detail in the previous risk assessments. To summarize, on an acute exposure basis, myclobutanil is classified as "moderately toxic" to freshwater and marine/estuarine fish, "slightly toxic" to freshwater invertebrates and "highly toxic" to estuarine/marine invertebrates. On a chronic exposure basis for freshwater fish, the reported NOAEC for the fathead minnow (*Pimephales promelas*) is 0.98 mg a.i./L, which is based on a 9.7% reduction in body length at 2.2 mg a.i./L. For marine/estuarine invertebrates, there were no effects to mysid shrimp (*Americamysis bahia*) tested up to the highest concentration of 0.0856 mg a.i./L (NOAEC= 0.0856 mg a.i./L). Data are

[11] USEPA. 2006. 1,2,4-Triazole, Triazole Alanine, Triazole Acetic Acid: Drinking Water Assessment in Support of Reregistration and Registration Actions for Triazole-derivative Fungicide Compounds DP Barcode D320682.

not available for freshwater invertebrates, however, the estimated NOAEC based on an acute to chronic toxicity ratio is 3.9 mg a.i./L. For aquatic plants, the $EC_{50}$ for green algae *(Selenastrum capricornutum)* is 0.83 mg a.i./L, with a NOAEC of 0.56 mg a.i./L based on a reduction in cell density. Data are not available for aquatic vascular plants. **Table 3** summarizes the most sensitive endpoints for aquatic animals and plants.

On an acute exposure basis, myclobutanil is classified as "slightly toxic" to birds, both on the acute oral and subacute dietary basis. There were no adverse effects observed in the avian reproduction studies and the NOAEC is 256 mg a.i./kg diet and the LOAEC is >256 mg a.i./kg diet. In mammals, myclobutanil is also classified as "slightly toxic" on an acute exposure basis. Reproductive effects were observed in the mammalian reproduction study (increases in testicular, epididymal and prostatic atrophy, a slight increase in the number of stillborns and a decrease in pup body weight gain during lactation). Supplemental data on honey bees exposed via contact to myclobutanil dust suggest that myclobutanil may not be toxic to honey bees. Data are not available for terrestrial plants. Incident data indicate that myclobutanil may cause damage to terrestrial plants. **Table 5** summarizes the most sensitive endpoints for terrestrial animals and plants.

***Degradate Toxicity***

The degradate 1,2,4-triazole along with its conjugates (Triazole alanine and Triazole acetic acid) are common metabolites of the Triazole class of compounds. Only the 1,2,4-triazole degradate was identified in the soil and water metabolism studies for myclobutanil. For the aquatic exposure assessment, concentrations of parent myclobutanil, the degradate 1,2,4-triazole, and total toxic residues (TTR) (myclobutanil plus 1,2,4-triazole) are estimated. The total residues for aquatic exposure is conservative if the toxicity of the 1,2,4-triazole is less than the toxicity of myclobutanil. There are three registrant-submitted studies on the toxicity of the 1,2,4-triazole degradate to aquatic organisms, but they are pending review. From these studies, it is provisionally concluded that 1,2,4-triazole exhibits no greater toxicity to aquatic organisms than the parent compound, myclobutanil. See the previous California Red legged Frog assessment for a full description of the aquatic toxicity data available for 1,2,4-triazole.[12]

For terrestrial exposure, toxicity data for the degradate, 1,2,4-triazole are available for mammals (**Table 6**). On an acute exposure basis, 1,2,4-triazole is less toxic than myclobutanil. For chronic exposure, the toxicity values for reproduction were essentially equal for the parent and degradate. While there was a slight decrease (compared to the control) in body weight and bodyweight gain for the F1 males exposed to the degradate (bodyweight gain was 6 and 11% of the control at the 15 and 31 mg/kg-bw/day treatments, respectively) and the NOAEL was not defined (<15 mg/kg-bw/day), based on the data it is unlikely that the there would be significant effects at doses much lower than 15 mg/kg-bw/day. Thus, given that the chronic toxicity endpoints of these two compounds are clearly within an order of magnitude of one another, this assessment will assume equal toxicity for myclobutanil and 1,2,4 triazole. For the conjugates (Triazole alanine and Triazole acetic acid), which were not observed in the environmental fate studies, chronic toxicity data for triazole alanine indicates that the triazole conjugates (triazole acetic acid is considered to be toxicologically equivalent to triazole alanine) exhibit less toxicity than the parent. The final degradate considered for terrestrial exposure is RH-9090, a plant metabolite (See **Appendix A** for the structure). Toxicity data are not available for this degradate; however, a structure activity analysis indicates that RH-9090 may have comparable toxicity to the parent. See the previous California Red legged Frog assessment for a full discussion of the degradate toxicity. For the terrestrial exposure assessment, a default foliar dissipation half-life of 35 days was used to account for terrestrial exposure to

[12] USEPA 2009. Risks of Myclobutanil Use to Federally Threatened California Red legged Frog (*Rana aurora draytonii*). Environmental Fate and Effects Division, OPP. June 17, 2009.

the parent, the primary plant metabolite RH-9090, the 1,2,4-triazole degradate and the triazole conjugates (triazole alanine and triazole acetic acid).

### 2.1 Toxicity to Aquatic Organisms

***Fish***

On an acute exposure basis, myclobutanil is classified as "moderately toxic" to freshwater and estuarine/marine fish with a 96-hour $LC_{50}$ of 2.4 mg a.i./L [Bluegill sunfish(*Lepomis macrochirus)* –MRID 00144285] and 4.7 mg a.i./L [Sheepshead minnow (*Cyprinodon variegatus)* –MRID 42747903], respectively. For chronic exposure, there is one submitted early life stage study for chronic toxicity to fish (MRID 00164986, 40409201, 40480401). Total length of juvenile fish at the end of the 35-day exposure was the most sensitive endpoint for the fathead minnow (*Pimephales promelas*); the reported NOAEC and LOAEC values are 0.98 mg/L and 2.2 mg/L, respectively. At the LOAEC (2.2 mg/L) there was a 9.7% reduction in mean total length compared to the control. Chronic toxicity data are not available for an estuarine/marine fish.

***Aquatic Invertebrates***

On an acute exposure basis, myclobutanil is classified as "slightly toxic" to freshwater invertebrates with a 48-hour $LC_{50}$ for myclobutanil of 11 mg a.i./L [Water flea (*Daphnia magna*)-MRID 00141678]. For estuarine/marine invertebrates, the most sensitive species was the mysid shrimp (*Americamysis bahia*-MRID 42747902) and with a 96-hour $EC_{50}$ of 0.24 mg a.i./L, myclobutanil is classified as "highly toxic" to estuarine/marine invertebrates.

On a chronic exposure basis, data are not available for freshwater invertebrates. For estuarine/marine invertebrates, based on a supplemental study with the mysid shrimp (*Americamysis bahia*), the LOAEC was not defined because there were no effects reported up through the highest test concentration of 0.0856 mg a.i./L; therefore, the NOAEC is 0.0856 mg a.i./L (MRID 47968901). Using an acute to chronic ratio the estimated NOAEC for freshwater invertebrates is 3.9 mg a.i./L based on the acute and chronic toxicity values for the estuarine/marine mysid shrimp and the acute toxicity values for the freshwater water flea (*Daphnia magna*).

***Aquatic Plants***

For non-vascular aquatic plants, data are only available for one species. For green algae (*Selenastrum capricornutum*-), the $EC_{50}$ is 0.83 mg a.i./L with a NOAEC of 0.56 mg a.i./L based on a reduction in cell density (MRID 41984801).

There are currently no submitted studies for vascular aquatic plants. In lieu of myclobutanil data, toxicity data from other conazole (DMI triazole) fungicides have previously been used in the 2009 CRLF assessment[13] to characterize risk to aquatic vascular plants assuming that myclobutanil toxicity is similar to other conazoles due to a similar mode of action. **Table 2** summarizes the toxicity endpoints for the seven conazoles with studies categorized as acceptable or supplemental that tested the technical product and resulted in a definitive endpoint.

[13] USEPA 2009. Risks of Myclobutanil Use to Federally Threatened California Red legged Frog (*Rana aurora draytonii*). Environmental Fate and Effects Division, OPP. June 17, 2009.

**Table 2. Conazole (DMI Triazole) Fungicide Toxicity to Aquatic Vascular Plants**

| Conazole | $EC_{50}$ (mg/L) [1] | Most sensitive parameter | MRID | Study Classification |
|---|---|---|---|---|
| Bromuconazole | 0.16 | Frond production | 42937141 | Acceptable |
| Difenoconazole | 1.9 | Frond number | 46950204 | Supplemental |
| Metconazole | 0.022 | Frond number | 46808428 | Acceptable |
| Propiconazole | 9.02 | Frond production | 00133363 | Supplemental |
| Prothioconazole | 0.073 | Frond number | 46246101 | Acceptable |
| Tetraconazole | 0.31 | Frond number | 45842201 | Acceptable |
| Triticonazole | 1.4 | Frond number | 44802119 | Acceptable |

[1] Based on toxicity to duckweed (*Lemna gibba*)

**Table 3** summarizes the most sensitive myclobutanil endpoints used for quantitative assessment of risk to aquatic animals and plants.

**Table 3. Acute and Chronic Toxicity of Myclobutanil to Aquatic Animals and Plants**

| Taxonomic Group | Study type | Surrogate Species | Toxicity | MRID (classification) | Acute Toxicity Classification |
|---|---|---|---|---|---|
| Freshwater fish | Acute | Bluegill Sunfish (*Lepomis macrochirus*) | 96-hr **$LC_{50}$: 2.4 mg a.i./L**<br>NOAEC = 1.5 mg a.i./L<br>LOAEC = 2.7 mg a.i./L based on quiescence, loss of equilibrium and death. | 00144285 (Acceptable) | Moderately toxic |
| | Chronic | Fathead minnow (*Pimephales promelas*) | NOAEC= **0.98 mg a.i./L**<br>LOAEC = 2.2 mg a.i./L based on a 9.7% reduction in body length.<br>Total mortality at 8.5 mg a.i./L | 00164986/ 40409201/ 40480401 (Acceptable) | N/A |
| Estuarine/ marine fish | Acute | Sheepshead minnow (*Cyprinodon variegatus*) | 96-hr **$LC_{50}$: 4.7 mg a.i./L**<br>NOAEC = 1.2 mg a.i./L<br>LOAEC = 1.8 mg a.i./L (erratic behavior, darkened pigmentation, lethargy; fish at higher concentration levels also exhibited partial loss of equilibrium and rapid respiration). Mortality observed at 3.8 mg a.i./L and above. | 42747903 (Acceptable) | Moderately toxic |
| | **Chronic** | **N/A** | **No Data** | — | — |
| Freshwater invertebrates | Acute | Water flea (*Daphnia magna*) | 48-hr **$EC_{50}$: 11 mg a.i./L**<br>NOAEC = 10 mg a.i./L<br>LOAEC = 5.6 mg a.i./L (settled to the bottom). Mortality observed at 10 mg a.i./L and above. | 00141678 (Acceptable) | Slightly toxic |
| | **Chronic** | **Water flea (*Daphnia magna*)** | **Estimated NOAEC using ACR= 3.9 mg a.i./L[2]** | — No Study | — |

| | | | | | |
|---|---|---|---|---|---|
| Estuarine /marine invertebrates | Acute | Eastern oyster (*Crassostrea virginica)* | 96-hr **$EC_{50}$: 0.68 mg a.i./L** NOAEC = 0.48 mg a.i./L LOAEC = 0.78 mg a.i./L (shell deposition). Inadequate shell growth in controls may underestimate pesticide related shell growth effects. | 42747901 (Supplemental) | Highly toxic |
| | | Mysid shrimp (*Americamysis bahia*) | 96-hr **$LC_{50}$: 0.24 mg a.i./L** Two studies:- NOAEC could not be determined in first study. $LC_{50}$ could not be determined in second study NOAEC = 0.043 mg a.i./L from second study LOAEC = 0.078 mg a.i./L (mortality; sublethal effects observed at levels where mortality was observed – lethargy, darkened pigmentation). | 42747902 (Acceptable) | Highly toxic |
| | Chronic | Mysid shrimp (*Americamysis bahia*) | **NOAEC: 0.0856 mg a.i./L** LOAEC: >0.0856 mg a.i./L No effects reported at any level. | 47968901 (Supplemental)[1] | N/A |
| Aquatic Plants | Non vascular | Green algae *(Selenastrum capricornutum)* | 120-hr **$EC_{50}$: 0.83 mg a.i./L** **NOAEC: 0.56 mg a.i./L** based on cell density. No study available for vascular plants | 41984801 (Acceptable) | N/A |
| | Vascular | **No Data** | --- | --- | --- |

[1]Classified as supplemental because of water quality issues (a maximum pH of 9.98 was reported at the nominal 20 ug a.i./L treatment level-may be upgradable with additional details on the pH measurements throughout the study)
[2] Estimated from the mysid acute and chronic toxicity data and the daphnid acute data using the acute to chronic ratio (ACR) [0.24/0.0856 x 11/x; x=3.9]

### 2.2 Toxicity to Terrestrial Animals and Plants

***Birds***

Based on the submitted acute oral toxicity study for the Bobwhite quail (MRID 00144286), myclobutanil is categorized as "moderately toxic" to birds on an acute oral basis with a $LD_{50}$ of 498 (408-598, 95% C.I.) mg/kg a.i.-bw.

Based on avian subacute dietary studies for two bird species, myclobutanil is categorized as "slightly toxic" on a dietary basis with subacute dietary $LC_{50}$s of >4090 mg a.i./kg-diet for the mallard duck (MRID 00144288) and > 4530 mg a.i./kg-diet for the bobwhite quail (MRID 00144287). Although no definitive subacute dietary $LC_{50}$s could be determined from these studies, there were mortalities in both studies. There was one mortality at 4090 mg a.i./kg-diet, the highest concentration tested in the mallard duck study and mortalities at 3000 and 4530 mg a.i./kg-diet (the highest concentrations tested in the bobwhite quail study).

Two avian chronic toxicity studies are available for myclobutanil. One-generation reproductive toxicity studies were conducted on both the mallard duck and bobwhite quail (MRID numbers 43087901 and 43087902). The studies were conducted simultaneously using the same dosing regimen. In both studies, no adverse effects were seen at the maximum level tested. Therefore, the NOAEC for both studies is 256

mg a.i./kg diet and the LOAEC is > 256 mg a.i./kg diet. While not an issue in this assessment as the EEC's are below 256 mg a.i./kg diet, these studies were originally classified as supplemental because the maximum concentration tested was below the expected environmental concentrations and there were no effects seen at the maximum level.

***Mammals***

On an acute exposure basis, myclobutanil is slightly toxic to small mammals with a reported $LD_{50}$ of 1360 mg a.i./kg-bw for the mouse. Acute toxicity data for the mouse with the 1,2,4-triazole degradate, indicates that 1,2,4-triazole is less toxic than the parent ($LD_{50}$ = 3650 mg/kg a.i.- bw) on an acute exposure basis (MRID 45284001).

On a chronic exposure basis, a two-generation reproduction study on rats conducted with myclobutanil reported a NOAEC/NOAEL of 200 mg a.i./kg-diet/16 mg/kg bw/day with a LOAEC of 1000 mg a.i./kg-diet (LOAEL=80 mg/kg bw/day) based on a decrease in pup body weight gain during lactation, an increased incidence in the number of stillborns and atrophy of the testes and prostate (offspring systemic and reproductive endpoints) (MRIDs 00149581 and 00143766).

Data for the degradate, 1,2,4-triazole are available from a two-generation reproduction study (MRID 46467304). The parental NOAEL is <15 mg/kg bw/day (LOAEL =15 mg/kg bw/day) based on a decrease in bodyweight and bodyweight gain and decrease in spleen weight. The offspring NOAEL is <19 mg/kg bw/day (LOAEL =19 mg/kg bw/day) based on decrease in bodyweight and bodyweight gain and brain and spleen weight. The reproductive NOAEL/LOAEL is 15/31 mg/kg bw/day based on abnormal sperm and a decrease in the number of corpora lutea. At 218 mg/kg bw/day, there was reproductive failure (no viable offspring) and an increase in corpora lutea in $F_0$ parental females.

This assessment assumes equal toxicity for the parent and the degradate 1,2,4-triazole. On an acute exposure basis, 1,2,4-triazole is less toxic than the parent. For chronic exposure, the toxicity values for reproduction were essentially equal for the parent and degradate. While there was a slight decrease (compared to the control) in body weight and bodyweight gain for the F1 males exposed to the degradate (bodyweight gain was 6 and 11% of the control at the 15 and 31 mg/kg-bw/day treatments, respectively) and the NOAEL was not defined (<15 mg/kg-bw/day), based on the data it is unlikely that the there would be significant effects at doses much lower than 15 mg/kg-bw/day. Thus, given that the chronic toxicity endpoints of these two compounds is clearly within an order of magnitude of one another, this assessment assumes equal toxicity for the purpose of risk assessment.

***Terrestrial Invertebrates***

Terrestrial invertebrates will not be quantitatively assessed in this assessment. However, the submitted data from a study with honey bees (*Apis mellifera L.*) exposed to myclobutanil applied as a dust suggest that myclobutanil (81.1%) technical is not toxic to adult honey bees at a dosage of 100 µg a.i./bee (MRID-00144289).

***Terrestrial Plants***

To date, there are no submitted toxicity data for terrestrial plants conducted with the parent or the degradate. In order to characterize the potential effects to terrestrial plants following exposure to myclobutanil in the risk description, terrestrial plant data from 5 other triazole DMI fungicides were summarized and discussed previously in the 2009 CRLF[14] assessment. **Table 4** provides a summary of the toxicity values and endpoints for the 5 triazole fungicides.

[14] U.S.EPA. 2009. Risks of Myclobutanil Use to Federally Threatened California Red legged Frog (*Rana aurora draytonii*). Environmental Fate and Effects Division, OPP. June 17, 2009.

**Table 4. Terrestrial Plant Toxicity Data for 5 Other DMI Fungicides**

| Fungicide | $EC_{25}$ (lbs a.i./A) | | NOAEC/$EC_{05}$ (lbs a.i./A) | | Effect/MRID | |
|---|---|---|---|---|---|---|
| | Seedling Emergence | Vegetative Vigor | Seedling Emergence | Vegetative Vigor | Seedling Emergence | Vegetative Vigor |
| **Metconazole** | | | | | | |
| Monocot | 0.78 | >0.6 | 0.3 | 0.6 | Ryegrass: reduced plant height 46805103 | 46805104 |
| Dicot | 0.15 | 0.44 | 0.075 | 0.0036 ($EC_{05}$) | Radish: reduced plant height 46805103 | Radish: reduced dry weight 46805104 |
| **Prothioconazole** | | | | | | |
| Monocot | >0.272 | >0.272 | 0.272 | 0.272 | 46246049 | 46246049 |
| Dicot | >0.272 | >0.272 | 0.03 | <0.272 | Cucumber: shoot height and dry weight 46246049 | 46246049 |
| **Cyproconazole** | | | | | | |
| Monocot | >0.64 | >0.62 | 0.64 | 0.62 | 46218512 | 46218511 |
| Dicot | 0.091 | 0.50 | 0.066 | 0.09 | Cabbage: fresh weight 46218512 | Cabbage: dry weight 46218511 |
| **Propiconazole** | | | | | | |
| Monocot | > 1.5 | 0.315 | 1.5 | 0.0815 | 41673201 | Rye grass: plant height 41673203 |
| Dicot | 0.18 | 0.039 | 0.056 | 0.056 | Cabbage: dry weight 41673201 | Cabbage: dry weight 41673203 |
| **Triticonazole** | | | | | | |
| Monocot | >4.25 | >4.2 | 1.3 | 4.2 | Rye grass: shoot length 44802116 | 44802116 |
| Dicot | 0.015 | 1.3 | 0.004 | 1.0 | Lettuce: shoot length 44802116 | Turnip: dry weight 44802116 |

**Table 5** summarizes the most sensitive myclobutanil endpoints used for quantitative assessment of risk to terrestrial animals and plants

**Table 5. Acute and Chronic Toxicity of Myclobutanil to Terrestrial Animals and Plants**

| Taxonomic Group | Study type | Surrogate Species | Toxicity | MRID (classification) | Acute Toxicity Classification |
|---|---|---|---|---|---|
| Birds | Acute/ Subacute | Bobwhite quail (*Colinus virginianus*) | Acute **$LD_{50}$: 498 mg a.i./kg-bw**<br>NOAEL: not determined<br>LOAEL: 316 mg/kg (lethargy and anorexia). Mortalities at all dose levels (1, 4, 8, 10 and 10, respectively). Good dose response. | 00144286 (Acceptable) | Slightly toxic |
| | | Mallard (*Anas platyrhynchos*) | Subacute dietary **$LC_{50}$: >4090 mg a.i./kg-diet**<br>NOAEC: 1250 mg a.i./kg-diet<br>LOAEC: 2220 mg a.i./kg-diet (anorexia and lethargy). One bird died at 4090 mg a.i./kg-diet. | 00144288 (Acceptable) | Slightly toxic |
| | Chronic | Bobwhite quail (*Colinus virginianus*) | **NOAEC: 256 mg a.i./kg-diet**<br>LOAEC: >256 mg a.i./kg-diet<br>No treatment-related effects at any level. | 43087901 (Supplemental) | N/A |
| Mammals | Acute | Laboratory mouse (*Mus musculus*) | **$LD_{50}$: 1360 mg a.i./kg bw**<br>Mortality at all dose levels tested. Multiple clinical signs, including ataxia, tremors, loss of righting and others – not dose-related; however, early deaths may have affected reporting. | 00165239/ 00141662 (Acceptable) | Slightly toxic |
| | Chronic | Laboratory rat (*Rattus norvegicus*) | **NOAEC (NOAEL): 200 mg a.i./kg-diet (16 mg/kg bw/day)**<br>LOAEC (LOAEL):1000 mg a.i./kg-diet (80 mg/kg bw/day) - testicular, epididymal and prostatic atrophy in P2 males; slight increase in stillborns, decrease in body weight gain in pups during lactation in F1 and F2 generations | 00149581/ 00143766 (Acceptable) | N/A |
| Terrestrial Invertebrates | Acute | Honey bee (*Apis mellifera L.*) | Contact $LD_{50}$<br>> 100 µg a.i./bee<br>*Not quantitatively assessed* | 00144289 (Acceptable) | N/A |
| Terrestrial plants | **N/A** | **N/A** | **No Data** | | |

**Table 6. Toxicity Data for the Degradate 1,2,4-Triazole**

| Taxonomic Group | Study type | Surrogate Species | Toxicity | MRID (classification) | Acute Toxicity Classification |
|---|---|---|---|---|---|
| Mammals | Acute | Laboratory mouse (*Mus musculus*) | **$LD_{50}$ = 3650 mg/kg-bw** | 46284001 | Practically non-toxic |
| | Chronic | Laboratory rat (*Rattus norvegicus*) | **Parental NOAEC(NOAEL): <250 mg a.i./kg-diet (15 mg/kg/day)**<br>Parental LOAEC (LOAEL): 250 mg a.i./kg-diet (15 mg/kg/day) based on decrease in bodyweight, bodyweight gain and spleen weight.<br>**Offspring NOAEC (NOAEL): <250 mg a.i./kg-diet (19 mg/kg/day)**<br>Offspring LOAEC/LOAEL: 250 mg a.i./kg-diet/19 mg/kg/day based on decrease in bodyweight, bodyweight gain, brain and spleen weights<br>**Repro NOAEC (NOAEL): 250 mg a.i./kg-diet (15 mg/kg/day)**<br>Repro LOAEC/LOAEL: 500 mg a.i./kg-diet/31 mg/kg/day based on abnormal sperm and ↓# of CL in $F_1$ females<br>At 3000 mg a.i./kg-diet (218 mg/kg/day), reproductive failure (no viable offspring), ↑CL in $F_0$ parental females | 46467304 | Acceptable |

## A. Exposure Estimates

### 1. Aquatic Exposure

The aquatic EECs for the proposed new uses were determined with the Tier 2 PRZM/EXAMS models[15]. The two standard Florida and Pennsylvania turf grass scenarios (PA Turf Std and FLTurf Std) were used the represent the proposed new uses. The environmental fate data have been discussed in detail elsewhere (USEPA, 2007[16], D336613). The environmental fate and other input values required to estimate myclobutanil concentrations with PRZM/EXAMS are summarized in **Table 7.** An aerobic aquatic metabolism study (MRID 47454401) not previously considered in assessments is included in this assessment.

[15] http://www.epa.gov/oppefed1/models/water/

[16] USEPA 2007. Myclobutanil. Ecological Risk Assessment on New Uses for Tropical Fruit, Fruiting Vegetables and Artichokes, October 12, 2007, DP Barcode D336613.

**Table 7. Input parameters for the Tier 2 PRZM/EXAMS models used in Parent Myclobutanil Aquatic EECs.**

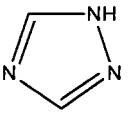
| Input | Value | Rationale |
|---|---|---|
| Application rate/number/interval | 0.20 lb a.i.$A^{-1}$ /4/14 days | Maximum proposed label use |
| Hydrolysis | 0 (stable) | USEPA, 2009 |
| Aquatic Photodegradation | 0 (stable) | USEPA, 2009 |
| Solubility | 142.0 mg/L | USEPA, 2009 |
| Vapor Pressure (@25 °C) | 9.75 x $10^{-6}$ mm Hg | MRID 46802501 |
| Henry's Law Constant | 2.6 x $10^{-8}$ atm-$m^3$/mol | calculated |
| Aerobic Soil Metabolism ($t_{1/2}$) Myclobutanil | 251 days | = Upper 90$^{th}$ bound on mean |
| Aerobic Aquatic Metabolism ($t_{1/2}$) Myclobutanil | 1283.48 days | Upper 90$^{th}$ bound on mean EFED Guidance (USEPA, 2009) (MRID 47454401) |
| Anaerobic Aquatic Metabolism ($t_{1/2}$) | 0 Stable | = Assumed stable to be conservative |
| Mobility (Freundlich $K_{ads}$) Myclobutanil | 5.03 mL/g | Average $K_d$ |
| Aerial Spray Drift | 0.05 (fraction) | USEPA, 2012 |
| Application Efficiency (Aerial Spray) | 0.95 (fraction) | USEPA, 2012 |

## Metabolites

The environmental fate and other input values used to the estimate 1,2,4-triazole residues in surface water with PRZM/EXAMS are summarized in **Table 8**. The values are generally the same as used by USEPA (2006) for the triazole aggregate drinking water assessment. The differences are the mean $K_F$ value (0.75 mL/g) was used instead of the lowest non-sand $K_F$ (0.72 mg/L) and solubility was not multiplied by a factor of 10[17]. The major degradation product of myclobutanil observed in the aerobic soil metabolism (ASM) studies included 1,2,4-triazole (maximum 18%). For the aggregate assessment, the maximum conversion of all triazoles (30.7%) was used. At the conclusion of the 367 day ASM study, 29 to 33 percent of the applied radioactivity remained as parent myclobutanil and 13 percent was identified as 1,2,4-triazole. Detailed information concerning the environmental fate of 1,2,4-triazole can be found in 1,2,4-Triazole, Triazole Alanine, Triazole Acetic Acid: Drinking Water Assessment in Support of Reregistration and Registration Actions for Triazole-derivative Fungicide Compounds (USEPA, 2006; D320682). Only the 1,2,4-triazole was observed in the environmental studies, hence only 1,2,4-triazole was included in the residues considered.

[17] USEPA 2006. 1,2,4-Triazole, Triazole Alanine, Triazole Acetic Acid: Drinking Water Assessment in Support of Reregistration and Registration Actions for Triazole-derivative Fungicide Compounds DP Barcode D320682

**Table 8. Summary of Environmental Fate and Chemistry and Model Input Parameters for 1,2,4-Triazole**

| Parameters | Input Value and Unit | Source of Info/Reference[18] |
|---|---|---|
| 1,2,4-Triazole | - |  |
| Application Rate<br><br>(18% conversion-myclobutanil to 1,2,4-T)<br><br>(30.7 % conversion-maximum observed conversion) | 4 applications @<br><br>0.0087[a] lb a.i./A per application/14 day interval<br><br>0.0147[a] lb a.i./A per application/14 day interval | after Maher et al. 2006[1]<br>(see discussion in Background on Aggregate Triazole Drinking Water Assessment section) |
| Soil Partition Coefficient ($K_f$) | 0.75 mL/g (average )<br>($K_{ads}$ 0.7 to 0.8) | MRID 40891501 |
| Molecular Weight | 69.07 g/mole | MRID 45574104 |
| Solubility (pH 7, 20 °C)[b] | 700,000 mg/l | MRID 45574104 |
| Vapor Pressure at 20 °C | 1.65 x $10^{-3}$ mm Hg | MRID 45574104 |
| Henry's Law Constant at 20 °C | 1.97 x $10^{-10}$ atm·$m^3$/mol | MRID 45574104 |
| Aerobic Soil Metabolism ($t_{1/2}$) | 250 days[1] | MRIDs: 45284032, 45297203, 45284027<br>MRIDs: 45284032, 45284027 |
| Aqueous Photolysis (pH 5) ($t_{1/2}$) | stable | MRID 45284026 |
| Hydrolysis ($t_{1/2}$) (pH7) | 161 days | MRID 43241019 |
| Aerobic aquatic metabolism half-life ($t_{1/2}$) | 500 days | 2 times the Aerobic Soil Metabolism (250 x 2) |
| Anaerobic aquatic metabolism half-life ($t_{1/2}$) | 0 | Assumed stable |

[a]- 1,2,4-Triazole application rate was obtained from molecular weight conversion times myclobutanil application rate times max percent formation rate for myclobutanil and all triazoles [myclobutanil =(69.0/288.78) * 0.20 lb a.i./A * 0.18) = 0.0086 lb a.i./A) and [all triazoles ((69.0/288.78) * 0.20 lb a.i./A * 0.307) = 0.0147 lb a.i./A)].

[b] –Note: The water solubility was previously multiplied by 10 by USEPA., 2006as previously recommended prior to 2009 by EFED Model Input Guidance http://www.epa.gov/oppefed1/models/water/input_parameter_guidance.htm.

The "application rates" for modeling the triazole degradate was based on the following: (1) assuming 30.7% conversion from parent to 1,2,4-triazole and (2) using molecular weight conversion to adjust from parent application rate to 1,2,4-triazole application rate (USEPA., 2006). Based on the laboratory and field studies, triadimefon had the highest conversion percentage (30.7%) to form 1,2,4-triazole among nine triazole forming fungicides (difenconazole, tebuconazole, triadimefon, triadimentol, propiconazole, myclobutanil, prothioconazole, fenbuconazole, and tetraconazole) USEPA. 2006). This assumption was

[18] USEPA. 2006. Memorandum: 1,2,4-Triazole, Triazole Alanine, Triazole Acetic Acid: Drinking Water Assessment in Support of Reregistration and Registration Actions for Triazole-derivative Fungicide Compounds. DP Barcode: D320682, February 28, 2006.

also made considering only myclobutanil, where the highest conversion percentage to form 1,2,4-triazole was 18.0% (**Table 8**).

*Total Residues*

The residues of concern are parent myclobutanil and the degradation product 1,2,4-triazole. Therefore, the Total Toxic Residue (TTR) approach was used to estimate the aquatic EECs. An aerobic soil metabolism half-life was previously determined for the combined myclobutanil plus 1,2,4-triazole in the California Red legged Frog Risk Assessment[19]. An aquatic metabolism half-lives for myclobutanil (no degradation products were identified) was estimated for the drinking water assessment prepared for this assessment (USEPA, 2012, D403754[20]) (**Table 9**). The average $K_{ads}$ for the degradate 1,2,4-triazole (average 0.75 mL/g) is used as it is more mobile than the parent myclobutanil (average $K_{ads}$ = 5.03 ml/g).

**Table 9. Input parameters for the Tier 2 PRZM/EXAM models used in Total Toxic Residues for Myclobutanil plus 1,2,4-Triazole Aquatic EECs.**

| Input | Value | Rationale |
|---|---|---|
| Application rate/number/interval | 0.20 lb a.i.$A^{-1}$ /4/14 days | Maximum proposed label use |
| Hydrolysis | 0 (stable) | USEPA, 2009 |
| Aquatic Photodegradation | 0 (stable) | USEPA, 2009 |
| Solubility | 142.0 mg/L | USEPA, 2009 |
| Aerobic Soil Metabolism ($t_{1/2}$) Myclobutanil | 315 days | = Upper 90$^{th}$ bound on mean |
| Aerobic Aquatic Metabolism ($t_{1/2}$) Myclobutanil | 1283.48 days | Upper 90$^{th}$ bound on mean EFED Guidance (USEPA, 2009) (MRID 47454401) |
| Anaerobic Aquatic Metabolism ($t_{1/2}$) | 0 Stable | = Assumed stable to be conservative |
| Mobility (Freundlich $K_{ads}$): 1,2,4-triazole | 0.75 mL/g | Average $K_{ads}$ |
| Aerial Spray Drift | 0.05 (fraction) | USEPA, 2012 |
| Application Efficiency (Aerial Spray) | 0.95 (fraction) | USEPA, 2012 |

*Aquatic Exposure Concentrations (EECs)*

Because fungicides are applied in response, or just prior to the onset of the disease, a number of different first dates (by month) of application were evaluated (**Appendix B**). The highest myclobutanil EECs were observed for the Pennsylvania turf scenario, with a first application on August 15 (8-15) (**Table 10**) with 4 applications. The 1,2,4-Triazole, combined (myclobutanil plus 1,2,4-Triazole and TTR were determined assuming that the initial application occurred on August 15 (**Table 10**). A representative outputs from PRZM/EXAMS is included in Appendix C.

[19] USEPA 2009. Risks of Myclobutanil Use to Federally Threatened California Red legged Frog (*Rana aurora draytonii*). Environmental Fate and Effects Division, OPP. June 17, 2009.

[20] USEPA, 2012. Drinking Water Exposure Concentrations for Proposed New Myclobutanil Uses on Grass Grown for Seed, Grass Pastures, Rangeland, and Sod Farms, November 20, 2012, DP Barcode D403754.

**Table 10. Maximum Tier 2 PRZM/EXAMs EECs for Myclobutanil, 1,2,4-Triazole and Total Toxic Residues Grass grown for seed, grass pastures, rangeland, and sod farms (4 application @ 0.20 lb a.i./year; 14 day interval)**

| Scenario | 1-Year in 10-Year | | | |
|---|---|---|---|---|
| Pennsylvania turf: month-date of 1st application (8-15) | Peak | 96-hr average | 21-day average | 60-day average |
| | (µg/L) | | | |
| **Myclobutanil** | | | | |
| Myclobutanil | 32.83 | 32.83 | 32.79 | 32.71 |
| **1,2,4-Triazole** | | | | |
| 1,2,4-T (18.0%) | 0.403 | 0.399 | 0.385 | 0.349 |
| 1,2,4-T (30.7%) | 0.661 | 0.654 | 0.631 | 0.573 |
| **Total Toxic Residues** | | | | |
| TOTR | 34.27 | 34.26 | 34.23 | 34.16 |

Since there is a potential for more than one season per year for sod (*i.e.*, Louisiana, Florida), EECs were estimated for sod being harvested three times per year (**Table 11**). Because the EECs are predominately myclobutanil parent, the EECs for parent alone at 2 (4 applications 2 times per year) and 3 (4 applications 3 times per year) seasons per year were also modeled **(Table 11) (Appendix B. Table 1).**

**Table 11. Maximum Tier 2 PRZM/EXAMs Myclobutanil used on Grass grown for seed, grass pastures, rangeland, and sod farms (4 application @ 0.20 lb a.i./season; 14 day interval with 1, 2, or 3 seasons per year.**

| Date of 1st Application for | | 1-Year in 10-Year Concentration (µg/L) | | | |
|---|---|---|---|---|---|
| Florida turf 1st/2nd/3rd application/season (m-d) | # Apps/# seasons | 96-hr average | 21-day average | 60-day average | 96-hr average |
| 8-15 | 4apps/1 | 19.47 | 19.45 | 19.38 | 19.19 |
| 1-15/6-10 | 4 apps/2 | 29.42 | 29.39 | 29.27 | 28.92 |
| 1-15/7-10 | " | 29.30 | 29.28 | 29.15 | 28.94 |
| 3-15/9-7 | " | 36.42 | 36.38 | 36.20 | 35.95 |
| 1-15/5-31/10-14 | 4 apps/3 | 45.52 | 45.48 | 45.30 | 45.04 |

**Terrestrial Exposure**

The EEC values used for terrestrial animal exposure are derived from the Kenaga nomograph, as modified by Fletcher *et al.* (1994)[21]. Terrestrial exposure estimates (dietary and dose-based) for avian and mammalian risk assessments were derived using the T-REX model (version 1.5.1 March 22, 2012) (**Tables 12-14** ). This assessment assumes that the parent and degradates are of equivalent toxicity. In the absence of foliar dissipation data for the parent and degradate, the default foliar dissipation half-life of 35 days (based on the work of Willis and McDowell[22], 1987) is used for modeling EECs on terrestrial food items. A complete description of the input parameters and output is contained in **Appendix D**.

[21] Fletcher, J.S., J.E. Nellesson, and T. G. Pfleeger. 1994. Literature review and evaluation of the EPA food-chain (Kenaga) nomogram, an instrument for estimating pesticide residues on plants. Environ. Tox. and Chem. 13(9):1383-1391.

[22] Willis, G.H. and L.L. McDowell. 1987. Pesticide persistence on foliage. Environ. Contam. Toxicol. Reviews. 100:23-73.

**Table 12. Avian Dietary EECs on Potential Food Items Following Proposed Label-Specified Applications of Myclobutanil Using the T-REX Model (ppm).**

| Dietary-based EECs (ppm) | Kenaga Values |
|---|---|
| Short Grass | 132.84 |
| Tall Grass | 60.88 |
| Broadleaf plants | 74.72 |
| Fruits/pods/seeds | 8.30 |
| Arthropods | 52.03 |

**Table 13. Avian Dose-based EECs (mg/kg-bw) Following Proposed Label-Specified Applications of Myclobutanil Using the T-REX Model.**

| Dose-based EECs (mg/kg-bw) | Avian Classes and Body Weights (grams) | | |
|---|---|---|---|
| | small 20 | mid 100 | large 1000 |
| Short Grass | 151.29 | 86.27 | 38.63 |
| Tall Grass | 69.34 | 39.54 | 17.70 |
| Broadleaf plants | 85.10 | 48.53 | 21.73 |
| Fruits/pods | 9.46 | 5.39 | 2.41 |
| Arthropods | 59.26 | 33.79 | 15.13 |
| Seeds | 2.10 | 1.20 | 0.54 |

**Table 14. Mammalian Dose-based EECs (mg/kg-bw) Following Proposed Label-Specified Applications of Myclobutanil Using the T-REX Model.**

| Dose-Based EECs (mg/kg-bw) | Mammalian Classes and Body weights (grams) | | |
|---|---|---|---|
| | 15 | 35 | 1000 |
| Short Grass | 126.65 | 87.53 | 20.29 |
| Tall Grass | 58.05 | 40.12 | 9.30 |
| Broadleaf plants | 71.24 | 49.24 | 11.42 |
| Fruits/pods | 7.92 | 5.47 | 1.27 |
| Arthropods | 49.61 | 34.28 | 7.95 |
| Seeds | 1.76 | 1.22 | 0.28 |

## III. Risk Characterization

### A. Risk Estimation

To evaluate the potential risk to non-target organisms from the proposed use of Myclobutanil, risk quotients (RQs) are calculated from the ratio of estimated environmental concentrations (EECs) of myclobutanil to toxicity values. RQs are then compared to levels of concern (LOCs) used by the Office of Pesticide Programs to indicate potential risk to non-target organisms and the need to consider regulatory action. The EPA's Levels of Concern (LOC) for potential risk to animals and plants are: (1) acute risk – when a RQ is equal to or greater than the LOC of 0.5 to animals; (2) acute restricted use – when a RQ is equal to or greater than the LOC of 0.2 and 0.1 for terrestrial and aquatic animals, respectively; (3) acute endangered species – when a RQ is equal to or greater than the LOC of 0.1 and

0.05 for terrestrial and aquatic animals, respectively; (4) chronic risk – when a RQ is equal to or greater than the LOC of 1.0 to animals; and (5) non-listed and listed plant risk - when a RQ is equal to or greater than the LOC of 1.0 to plants.

### 1. Risk to Aquatic Organisms

The linked PRZM/EXAMS models were used to provide exposure concentrations of Myclobutanil + 1,2,4-T from an application rate of 0.2 lb a.i./A applied 4 times at 14 day intervals. The EECs and resulting RQ values indicate that there are no acute, acute restricted, or chronic LOC exceedances for aquatic organisms with the proposed use of myclobutanil based on a single growing season per year (**Table 15**). However, there was one endangered species LOC exceedance for estuarine/marine invertebrates (based on an RQ value of 0.05).

**Table 15. Acute and Chronic Aquatic Risk Quotients for the Proposed Use of Myclobutanil**

| Taxonomic Group | Exposure Type | EEC [Total Toxic Residues] ( µg/L ) | Toxicity | RQ | Agency LOC for acute or chronic[2] | Above LOC (yes/no) |
|---|---|---|---|---|---|---|
| Freshwater Fish | Acute | 34.273 | $LC_{50}$: 2,400 µg a.i.//L | 0.014 | ≥0.5, ≥0.1, ≥0.05 | No |
| | Chronic | 34.156 | NOAEC= 980 µg a.i./L | 0.035 | 1 | No |
| Estuarine/Marine Fish | Acute | 34.273 | $LC_{50}$: 4,700 µg a.i./L | 0.007 | ≥0.5, ≥0.1, ≥0.05 | No |
| | | | | | | |
| Freshwater Invertebrate | Acute | 34.273 | $EC_{50}$: 11,000 µg a.i./L | 0.003 | ≥0.5, ≥0.1, ≥0.05 | No |
| | Chronic | 34.226 | NOAEC: 3,900 µg a.i./L Estimated using ACR | 0.009 | 1 | No |
| Estuarine/Marine Invertebrates | Acute | 34.273 | $EC_{50}$: 680 µg a.i.//L | 0.050 | ≥0.5, ≥0.1, ≥0.05 | Yes |
| | Chronic | 34.226 | NOAEC: 85.6 µg a.i./L | 0.400 | 1 | No |
| Freshwater Benthic Invertebrates | | | | | | |
| Aquatic plants (Non-vascular/algae) | Non-listed | 34.273 | $EC_{50}$: 830 µg a.i./L | 0.041 | 1 | No |
| | Listed | 34.273 | NOAEC: 560 µg a.i./L | 0.061 | 1 | No |

[1] EECs for acute (fish and invertebrates) RQ calculations are from peak Pennsylvania turf scenario; the chronic invertebrate RQ was calculated using the 21-day average EEC; the chronic fish RQ was calculated using the 60-day average EEC

[2] The Agency LOC for acute is >0.5, >0.1, and >0.05 for acute, acute restricted, and acute listed species, respectively.

## 2. Risk to Terrestrial Animals

The EFED terrestrial exposure model, T-REX was used to estimate exposures and risks to avian and mammalian species. The model provides estimates of exposure concentrations and RQs from an application rate of 0.2 lb a.i./A applied 4 times at 14 day intervals (1 growing season per year). **Tables 16-20** below show the results of the T-REX model outputs. The RQs in bold denotes the LOC exceedances.

### *Birds*

Based on upper bound avian dose-based RQs (**Table 16**), the acute restricted use LOC is exceeded for 20 gram birds feeding on short grass and broadleaf plants. Additionally, the listed species LOC is exceeded for 20 gram birds feeding on tall grass, arthropods and 100 gram birds feeding on short grass and broadleaf plants. For subacute exposure, RQ values were not derived because the toxicity endpoints were non-definitive (*i.e., the available $LC_{50}$ values were a 'greater than' value and there were no effects at the highest concentration tested).* On a chronic exposure basis, the RQs (**Table 17**) do not exceed the EPA's LOC.

**Table 16. Upper Bound Kenaga, Acute Avian Dose-Based Risk Quotients**

| Size Class (g) | Adjusted LD50 | EECs and RQs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Short Grass | | Tall Grass | | Broadleaf Plants | | Fruits/Pods/ Seeds | | Arthropods | | Granivore | |
| | | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ |
| 20 | 358.77 | 151.3 | **0.42** | 69.3 | **0.19** | 85.1 | **0.24** | 9.5 | 0.03 | 59.3 | **0.17** | 2.1 | 0.01 |
| 100 | 456.74 | 86.3 | **0.19** | 39.5 | 0.09 | 48.5 | **0.11** | 5.4 | 0.01 | 33.8 | 0.07 | 1.2 | 0 |
| 1000 | 645.16 | 38.6 | 0.06 | 17.7 | 0.03 | 21.7 | 0.03 | 2.4 | 0 | 15.1 | 0.02 | 0.54 | 0 |

**Table 17. Upper Bound Kenaga, Chronic Avian Dietary Based Risk Quotients**

| | EECs and RQs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Short Grass | | Tall Grass | | Broadleaf Plants | | Fruits/Pods/Seeds | | Arthropods | |
| NOAEC (ppm) | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ |
| 256 | 132.84 | 0.52 | 60.88 | 0.24 | 74.72 | 0.29 | 8.30 | 0.03 | 52.03 | 0.20 |

### *Mammals*

On an acute exposure basis, the RQs (**Table 18**) do not exceed the EPA's LOCs for any of the weight/dietary classes of mammals. On a chronic exposure basis, there are no LOC exceedances using the dietary based RQs, however, there are LOC exceedances for the 15 and 35 gram mammals feeding on short grass, tall grass, broadleaf plants, and arthropods for dose-based RQs (**Tables 19 and 20**). Additionally, there are LOC exceedances for 1000 gram mammals feeding on short grass.

**Table 18. Upper Bound Kenaga, Acute Mammalian Dose-Based Risk Quotients**

| Size Class (g) | Adjusted LD50 | EECs and RQs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Short Grass | | Tall Grass | | Broadleaf Plants | | Fruits/Pods /Seeds | | Arthropods | | Granivore | |
| | | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ |
| 15 | 1461.42 | 126.7 | 0.09 | 58.0 | 0.04 | 71.2 | 0.05 | 7.9 | 0.01 | 49.61 | 0.03 | 1.8 | 0 |
| 35 | 1182.44 | 87.5 | 0.07 | 40.1 | 0.03 | 49.2 | 0.04 | 5.5 | 0.00 | 34.28 | 0.03 | 1.2 | 0 |
| 1000 | 511.44 | 20.3 | 0.04 | 9.3 | 0.02 | 11.4 | 0.02 | 1.3 | 0.00 | 7.95 | 0.02 | 0.28 | 0 |

**Table 19. Upper Bound Kenaga, Chronic Mammalian Dietary-Based Risk Quotients**

| NOAEC (ppm) | EECs and RQs | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Short Grass | | Tall Grass | | Broadleaf Plants | | Fruits/Pods/ Seeds | | Arthropods | |
| | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ |
| 200 | 132.84 | 0.66 | 60.88 | 0.30 | 74.72 | 0.37 | 8.30 | 0.04 | 52.03 | 0.26 |

**Table 20. Upper Bound Kenaga, Chronic Mammalian Dose-Based Risk Quotients**

| Size Class (g) | Adjusted NOAEL | EECs and RQs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Short Grass | | Tall Grass | | Broadleaf Plants | | Fruits/Pods/ Seeds | | Arthropods | | Granivore | |
| | | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ | EEC | RQ |
| 15 | 35.17 | 126.7 | **3.60** | 58.0 | **1.65** | 71.2 | **2.03** | 7.9 | 0.23 | 49.6 | **1.41** | 1.8 | 0.05 |
| 35 | 28.45 | 87.5 | **3.08** | 40.1 | **1.41** | 49.2 | **1.73** | 5.5 | 0.19 | 34.3 | **1.20** | 1.2 | 0.04 |
| 1000 | 12.31 | 20.3 | **1.65** | 9.3 | 0.76 | 11.4 | 0.93 | 1.3 | 0.10 | 7.9 | 0.65 | 0.3 | 0.02 |

## IV. Review of Incident Data

The Ecological Incident Information System (EIIS) database was queried on 12/18/12 for incidents related to myclobutanil use. There were three incident reports filed for myclobutanil between 1994 and 2003, all with effects on terrestrial plants (two incidents with grapes and one with roses). The two incidents with grapes occurred in California and the one with roses was reported in Maryland. The certainty index for the damage in all 3 incidents was rated as possibly related to exposure to myclobutanil. The two incidents with grapes involved application of other pesticides as well as the myclobutanil. Therefore, it is not definitively known whether or not the effects were due to exposure to myclobutanil in these two incidents. Myclobutanil was the only pesticide applied to the rose bushes in the third reported incident.

Incident 1: Rally 40W (myclobutanil), Pro Gibb (gibberellic acid), dimethogan 25 WP, Pro Kil Cryolite 96 (sodium fluoaluminate), Britz binder and Booster 42 Foliar Spray (polymeric polyhydroxy acids) were applied by ground application to grape vines. Shortly after the last application, scarring of the berries, stunted vine growth, lack of berry size increase, dieback of fruit from total bunches and limited cone growth with straggly branches were observed. No residue analysis was conducted. The California Commissioner's report indicated that mixtures of Pro-Gibb 4% and Pro-Kil Cryolite 96 may cause some compatibility problems. No specific data on terrestrial plants were found in the Agency files for any of the pesticides applied on this incident.

Incident 2: It was reported that Rally 40W damaged 6 acres of Red Globe and Thompson's grapes to the point that they could not be sold. Burns and necrosis on bunches (Red Globe) and leaf burn (Thompson's) were observed. Agri-MEK (abamectin) and Ad-Wet were also applied, using a ground spray on the vineyard. Again, no specific data on terrestrial plants were found in the Agency files for any of the pesticides applied on this incident.

Incident 3: Systhane (myclobutanil) was applied via a broadcast spray to rose bushes grown in greenhouses by local residents in Maryland. The total magnitude was 200 houses. Foliar necrosis and some defoliation were observed after exposure to systhane. Damage varied from house to house and by rose variety.

Additionally, a query of the aggregate Incident System (IDS) on 12/18/2012 reported 28 incidents to plants (dates ranging from 1998-2005).

The Avian Incident Monitoring System (AIMS), a database administered by the American Bird Conservancy, was queried for myclobutanil on 12/18/12 and to date, there were no bird incidents reported.

## V. Risk Description

### *Aquatic Organisms*

For the proposed use, the risk to fish and freshwater aquatic invertebrates is low based on the modeling for a single growing season per year. For estuarine/marine invertebrates, the listed species LOC was exceeded with an RQ value of 0.05. To better understand the risk to aquatic organisms under the conditions that there are multiple growing seasons per year (either two or three -FL scenario), additional modeling was done to estimate the exposures. The results show that the additional applications did not have a significant impact on the risk conclusions. With the exception of acute exposure to estuarine/marine invertebrates, there were no LOC exceedances when a total of 8 applications (two seasons/yr) or 12 applications (three seasons/yr) were modeled. For estuarine/marine invertebrates, the RQs for acute exposure were, 0.048, 0.054, and 0.067 for 4, 8, and 12 applications, respectively. While the listed species LOC was exceeded when 8 and 12 applications were modeled, the overall change in the risk is relatively minor based on the LOC values.

There were limited data available to assess the risk to aquatic plants from exposure to myclobutanil. While the RQ values for non-vascular plants did not exceed the LOC, there is some uncertainty because they are based on data from one species *(Selenastrum capricornutum)*. Current EFED guidance indicates that risk assessments should be based on data from the most sensitive of the four nonvascular test organisms [*Pseudokirchneriella subcapitata* (formerly *Selenastrum capricornutum*), a freshwater green algae; *Anabaena flos-aquae*, a freshwater cyanobacterium; *Navicula pelliculosa*, a freshwater pinnate diatom; and *Skeletonema costatum*, an estuarine/marine centric diatom] because these species represent distinctly different taxa, habitats, and ecological/functional niches[23]. Given the lack of data on three of the four species, the uncertainty of species variability in sensitivity to toxicants, and that there would be LOC exceedances if the $EC_{50}$ was 25 times more sensitive (less than 2 orders of magnitude) than seen with the green algae *(Selenastrum capricornutum)*, risk to non-vascular aquatic plants is assumed.

Aquatic vascular plant toxicity data are not available for myclobutanil. In the absence of toxicity data for myclobutanil, data from seven other conazoles were previously summarized in the 2009 CRLF assessment. For the seven conazole fungicides evaluated, the range of 7/14-day $EC_{50}$s was 0.02 to 9.02

[23] US EPA, 2008. Memorandum from D. Brady to OPP EFED. Clarification Regarding Aquatic Plant Risk Estimation. September 30, 2011.

mg a.i./L and the mean was 1.84 mg a.i./L. Assuming that myclobutanil toxicity to aquatic vascular plants is similar to other conazoles, there were no exceedences of the LOC using the $EC_{50}$ data from 6 of the 7 conazoles and the conazole mean $EC_{50}$. However, using the most sensitive endpoint (metconazole = 0.02 mg a.i./L), resulted in an RQ value of 1.5 and therefore, a LOC exceedance. Metaconazole toxicity data suggests the possibility of effects from myclobutanil on aquatic vascular plants that may exceed the LOC. However, there is also considerable uncertainty associated with extrapolating toxicity from other conazoles to myclobutanil, thus the effects of myclobutanil cannot be quantified without data on myclobutanil toxicity to aquatic vascular plants. In the absence of data, risk to vascular aquatic plants is assumed.

***Terrestrial Organisms***

***Birds***

As shown in the risk estimation section, the acute dose-based LOCs (acute restricted and listed species) were exceeded for birds in several dietary/size classes with dose-based RQs ranging from <0.01-0.42, but were not exceeded for the non-endangered species acute RQ (**Table 16**). As stated earlier, RQs were not estimated for the subacute dietary studies because the $LC_{50}$s are non-definitive (*i.e., the available $LC_{50}$ values are a 'greater than' value and there were no effects at the highest concentration tested).* In order to gain a better understanding of how the EECs relate to the subacute toxicity data currently available, the highest level tested was used as a conservative endpoint. The resulting estimated RQ values were well below the LOC. In this assessment, the potential risk is higher based on the acute oral study versus the dietary exposure study; however, it is not atypical for birds to be more sensitive to pesticides via an oral route versus a sub-acute dietary route. In summary, on an acute exposure basis, there is a risk identified to birds in several dietary/size classes. For chronic exposure to birds, there are no LOC exceedances. Thus, the risk to birds on a chronic exposure basis is low.

***Mammals***

On an acute exposure basis, the RQ values for mammals do not exceed the EPA's LOC for any of the weight/dietary classes of mammals. On a chronic exposure basis, there are LOC exceedances (RQs range from 0.1-3.6) for several dietary/size classes of mammals **(Table 20)**. Therefore, there is a risk to mammals from chronic exposure based on the proposed new use.

To better understand the exposure and potential risk to birds and mammals for multiple growing seasons per year (either two or three), additional TREX modeling was conducted to estimate the exposures. The results show that the additional applications did not have an impact on the risk conclusions (with one minor exception-when modeling three seasons per year, the acute risk to 20 gram birds feeding on tall grass exceeded the acute restricted use LOC in addition to the listed species LOC exceedance noted at one and two seasons per year.)

***Terrestrial Invertebrates***

EFED does not currently estimate risk for terrestrial invertebrates. Based on the acute contact toxicity study to honeybees, the $LD_{50}$ for myclobutanil is >100 µg/bee. This classifies myclobutanil as practically non-toxic to honeybees on an acute contact exposure basis, and therefore precautionary bee language on the label does not appear necessary.

***Terrestrial Plants***

Toxicity data are not available to assess the risk of myclobutanil to non-target plants. In the previous 2009 CLF assessment[24], an analysis of 5 other DMI triazole fungicides was conducted to get a better understanding of the potential risk to non-target plants from myclobutanil. For risk description purposes,

[24] USEPA 2009. Risks of Myclobutanil Use to Federally Threatened California Red legged Frog (*Rana aurora draytonii*). Environmental Fate and Effects Division, OPP. June 17, 2009.

the toxicity data from these a.i.'s (see **Table 2**) were used in the TerrPlant model (V. 1.2.2) as surrogates for myclobutanil, using the solubility of myclobutanil for the potential runoff fraction. In general, using the endpoints from the other triazole DMI fungicides with the myclobutanil application rates, dicots living in semi-aquatic areas would be the most sensitive terrestrial plant species. The TerrPlant model was used to determine the myclobutanil application rates that would exceed the LOC for listed dicots and non-listed dicots inhabiting semi-aquatic areas for both aerial and ground applications. **Table 21** summarizes these application rates.

**Table 21. Myclobutanil Application Rates Combined with Endpoints from 5 Triazole DMI Fungicides Exceeding the Terrestrial Plant LOC for Listed and Non-Listed Dicots in Semi-Aquatic Areas**

| Triazole Fungicide | Application Rate (lbs a.i./A) | | | |
|---|---|---|---|---|
| | Non-listed dicots | | Listed dicots | |
| | Aerial, Airblast, Spray Chemigation | Ground | Aerial, Airblast, Spray Chemigation | Ground |
| Cyproconazole | **0.16** | **0.17** | **0.12** | **0.13** |
| Metconazole | 0.28 | 0.30 | **0.14** | **0.15** |
| Propiconazole | 0.33 | 0.36 | **0.10** | **0.11** |
| Prothioconazole | Not available[1] | Not available[1] | **0.05** | **0.06** |
| Triticonazole | **0.03** | **0.03** | **0.007** | **0.008** |

[1] No $EC_{25}$ available
**BOLD** = rate less than the proposed rate of 0.2 lba.i./A

It is noted that the labeled uses of myclobutanil include direct application to a variety of terrestrial plants (agricultural and ornamental) at multiple growth stages (e.g., seed treatment, pre-bloom, bloom, foliar, post-bloom etc.). Considering the fact that the labels provide for exposure to terrestrial plants throughout the growth stage, it is probable that the damage to the crops is not so extensive to inhibit the use of this pesticide by applicators. Nevertheless, due to the weight of the evidence from the reported incidents (See section IV) and the fact that surrogate toxicity data from similar fungicides would exceed the terrestrial plant LOCs at the proposed rate for myclobutanil (0.2 lb. a.i./A), in the absence of data, risk to non-target plants is assumed.

## VI. Federally Threatened and Endangered Species Concerns

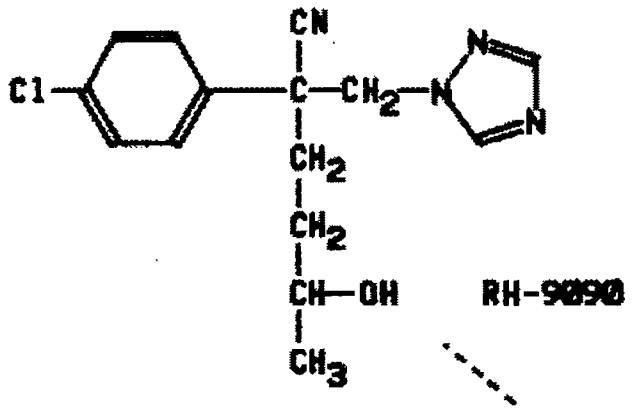
The goal of the analysis for co-location is to determine whether sites of pesticide use are geographically associated with known locations of listed species. At the screening level, this analysis is accomplished using the LOCATES Database (V 2.2.4). The database uses location information for listed species at the county level and compares it to agricultural census data for crop production at the same county level of resolution. The product is a listing of federally listed species that are located within counties known to produce the crop upon which the pesticide will be used. For this assessment the following use sites were queried in the database: sod (harvested in the open), field and grass seed crops, and forage as the best match for the proposed use on grass grown for seed, grass pastures/rangeland, and sod farms. Due to the way the census collects the data (*i.e., there is not an exact match for the proposed new uses*), this analysis may over or underestimate the co-occurrence. However, in general, the data suggest that there is considerable potential for exposure to a variety of endangered species from myclobutanil uses.

**Table 22** provides a summary of the LOCATES output. In addition to this information, the LOCATES output includes a comprehensive listing of species scientific names and species counts specific for each state; this additional information is available upon request.

**Table 22. LOCATES Output for Co-occurrence**

| | |
|---|---|
| Amphibian | 20 |
| Arachnid | 12 |
| Bird | 71 |
| Bivalve | 83 |
| Conf/cycds | 2 |
| Coral | 2 |
| Crustacean | 20 |
| Dicot | 611 |
| Ferns | 21 |
| Fish | 97 |
| Gastropod | 67 |
| Insect | 59 |
| Lichen | 2 |
| Mammal | 76 |
| Monocot | 65 |
| Reptile | 30 |
| **Total** | **1238** |

**Appendix A. Plant Metabolite (RH-9090) Structure**



**APPENDIX B. Summary of Myclobutanil and Myclobutanil plus 1,2,4-Triazole EECS .**

**Tier 2 PRZM/EXAMS Myclobutanil EECs Grass grown for seed, grass pastures, rangeland, and sod farms (4 application @ 0.20 lb a.i./year; 14 day interval)**

| Scenario | Number of Applications per Year | 1-year in10-year (µg/L) | | | |
|---|---|---|---|---|---|
| **Florida turf (month-date of 1st application)** | | **Peak (µg/L)** | **96-hr average** | **21-day average** | **60-day average** |
| 1-15 | 4 apps | 14.98 | 14.961 | 14.882 | 14.713 |
| 2-15 | | 17.683 | 17.662 | 17.605 | 17.406 |
| 3-15 | | 17.89 | 17.851 | 17.706 | 17.479 |
| 4-15 | | 16.987 | 16.967 | 16.857 | 16.657 |
| 5-15 | | 16.274 | 16.236 | 16.118 | 15.903 |
| 6-15 | | 14.96 | 14.94 | 14.839 | 14.703 |
| 7-15 | | 16.749 | 16.719 | 16.61 | 16.408 |
| 8-15 | | 19.475 | 19.454 | 19.379 | 19.195 |
| 9-15 | | 18.359 | 18.311 | 18.147 | 17.886 |
| 10-15 | | 17.975 | 17.946 | 17.827 | 17.276 |
| 11-15 | | 16.176 | 16.153 | 16.079 | 15.909 |
| | | | | | |
| 1-15/6-10 | 8 apps | 29.419 | 29.389 | 29.268 | 28.917 |
| 1-15/7-10 | | 29.297 | 29.276 | 29.148 | 28.939 |
| 3-15/9-7 | | 36.422 | 36.382 | 36.2 | 35.952 |
| | | | | | |
| 1-15/5-31/10-14 | 12 apps | 45.518 | 45.479 | 45.299 | 45.041 |
| | | | | | |
| **Pennsylvania Turf** | | | | | |
| 5-15 | 4 apps | 27.321 | 27.291 | 27.196 | 26.91 |
| 6-15 | | 27.812 | 27.771 | 27.61 | 27.339 |
| 7-15 | | 30.014 | 29.993 | 29.937 | 29.572 |
| 8-15 | | **32.834** | **32.831** | **32.793** | **32.708** |
| 9-15 | | 24.947 | 24.928 | 24.853 | 24.721 |

## Appendix C. PRZM/EXAMS Model Output from PE5

### Myclobutanil

stored as PAturf.out
Chemical: Myclobutanil
PRZM environment: PAturfSTD.txt modified Thuday, 23 February 2006 at 17:55:08
EXAMS environment: pond298.exv modified Tueday, 26 August 2008 at 05:14:08
Metfile: w14751.dvf modified Tueday, 26 August 2008 at 05:15:00
Water segment concentrations (ppb)

| Year | Peak | 96 hr | 21 Day | 60 Day | 90 Day | Yearly |
|---|---|---|---|---|---|---|
| 1961 | 2.868 | 2.855 | 2.807 | 2.726 | 2.682 | 0.9017 |
| 1962 | 5.822 | 5.805 | 5.737 | 5.624 | 5.553 | 3.367 |
| 1963 | 7.547 | 7.532 | 7.476 | 7.44 | 7.425 | 5.889 |
| 1964 | 9.266 | 9.249 | 9.192 | 9.091 | 9.039 | 7.75 |
| 1965 | 10.56 | 10.55 | 10.5 | 10.4 | 10.35 | 9.17 |
| 1966 | 18.78 | 18.72 | 18.55 | 18.32 | 18.14 | 12.38 |
| 1967 | 18.15 | 18.13 | 18.08 | 18.03 | 17.97 | 17.26 |
| 1968 | 20.85 | 20.82 | 20.7 | 20.52 | 20.43 | 18.28 |
| 1969 | 20.55 | 20.54 | 20.49 | 20.37 | 20.29 | 19.74 |
| 1970 | 20.57 | 20.54 | 20.46 | 20.41 | 20.35 | 19.82 |
| 1971 | 21.29 | 21.27 | 21.17 | 21 | 20.93 | 20.02 |
| 1972 | 21.2 | 21.18 | 21.15 | 21.06 | 21.06 | 20.38 |
| 1973 | 29.38 | 29.32 | 29.11 | 28.87 | 28.66 | 22.84 |
| 1974 | 29.31 | 29.27 | 29.16 | 28.98 | 28.88 | 27.57 |
| 1975 | 34.33 | 34.27 | 34.04 | 33.64 | 33.4 | 29.19 |
| 1976 | 33.54 | 33.52 | 33.41 | 33.26 | 33.15 | 32.12 |
| 1977 | 32.86 | 32.86 | 32.83 | 32.76 | 32.69 | 31.98 |
| 1978 | 31.75 | 31.74 | 31.72 | 31.66 | 31.6 | 30.96 |
| 1979 | 32.6 | 32.57 | 32.46 | 32.24 | 32.11 | 30.53 |
| 1980 | 32.44 | 32.41 | 32.31 | 32.17 | 31.84 | 31.01 |
| 1981 | 31.97 | 31.96 | 31.92 | 31.83 | 31.74 | 31.07 |
| 1982 | 30.84 | 30.83 | 30.81 | 30.76 | 30.7 | 30.21 |
| 1983 | 30.06 | 30.05 | 30.01 | 29.92 | 29.84 | 29.29 |
| 1984 | 29.19 | 29.19 | 29.17 | 29.1 | 29.03 | 28.55 |
| 1985 | 30.97 | 30.93 | 30.78 | 30.52 | 30.38 | 28.47 |
| 1986 | 30 | 29.99 | 29.96 | 29.89 | 29.82 | 29.25 |
| 1987 | 30.28 | 30.25 | 30.14 | 29.98 | 29.9 | 28.81 |
| 1988 | 29.53 | 29.52 | 29.5 | 29.44 | 29.38 | 28.8 |
| 1989 | 29.64 | 29.6 | 29.5 | 29.38 | 29.3 | 28.37 |
| 1990 | 29.11 | 29.09 | 28.99 | 28.9 | 28.82 | 28.38 |

Sorted results

| Prob. | Peak | 96 hr | 21 Day | 60 Day | 90 Day | Yearly | | |
|---|---|---|---|---|---|---|---|---|
| 0.032258064516129 | | | 34.33 | 34.27 | 34.04 | 33.64 | 33.4 | 32.12 |
| 0.0645161290322581 | | | 33.54 | 33.52 | 33.41 | 33.26 | 33.15 | 31.98 |
| 0.0967741935483871 | | | 32.86 | 32.86 | 32.83 | 32.76 | 32.69 | 31.07 |
| 0.129032258064516 | | | 32.6 | 32.57 | 32.46 | 32.24 | 32.11 | 31.01 |
| 0.161290322580645 | | | 32.44 | 32.41 | 32.31 | 32.17 | 31.84 | 30.96 |
| 0.193548387096774 | | | 31.97 | 31.96 | 31.92 | 31.83 | 31.74 | 30.53 |
| 0.225806451612903 | | | 31.75 | 31.74 | 31.72 | 31.66 | 31.6 | 30.21 |
| 0.258064516129032 | | | 30.97 | 30.93 | 30.81 | 30.76 | 30.7 | 29.29 |
| 0.290322580645161 | | | 30.84 | 30.83 | 30.78 | 30.52 | 30.38 | 29.25 |
| 0.32258064516129 | | | 30.28 | 30.25 | 30.14 | 29.98 | 29.9 | 29.19 |
| 0.354838709677419 | | | 30.06 | 30.05 | 30.01 | 29.92 | 29.84 | 28.81 |
| 0.387096774193548 | | | 30 | 29.99 | 29.96 | 29.89 | 29.82 | 28.8 |
| 0.419354838709677 | | | 29.64 | 29.6 | 29.5 | 29.44 | 29.38 | 28.55 |
| 0.451612903225806 | | | 29.53 | 29.52 | 29.5 | 29.38 | 29.3 | 28.47 |
| 0.483870967741936 | | | 29.38 | 29.32 | 29.17 | 29.1 | 29.03 | 28.38 |
| 0.516129032258065 | | | 29.31 | 29.27 | 29.16 | 28.98 | 28.88 | 28.37 |
| 0.548387096774194 | | | 29.19 | 29.19 | 29.11 | 28.9 | 28.82 | 27.57 |
| 0.580645161290323 | | | 29.11 | 29.09 | 28.99 | 28.87 | 28.66 | 22.84 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.612903225806452 | 21.29 | 21.27 | 21.17 | 21.06 | 21.06 | 20.38 |
| 0.645161290322581 | 21.2 | 21.18 | 21.15 | 21 | 20.93 | 20.02 |
| 0.67741935483871 | 20.85 | 20.82 | 20.7 | 20.52 | 20.43 | 19.82 |
| 0.709677419354839 | 20.57 | 20.54 | 20.49 | 20.41 | 20.35 | 19.74 |
| 0.741935483870968 | 20.55 | 20.54 | 20.46 | 20.37 | 20.29 | 18.28 |
| 0.774193548387097 | 18.78 | 18.72 | 18.55 | 18.32 | 18.14 | 17.26 |
| 0.806451612903226 | 18.15 | 18.13 | 18.08 | 18.03 | 17.97 | 12.38 |
| 0.838709677419355 | 10.56 | 10.55 | 10.5 | 10.4 | 10.35 | 9.17 |
| 0.870967741935484 | 9.266 | 9.249 | 9.192 | 9.091 | 9.039 | 7.75 |
| 0.903225806451613 | 7.547 | 7.532 | 7.476 | 7.44 | 7.425 | 5.889 |
| 0.935483870967742 | 5.822 | 5.805 | 5.737 | 5.624 | 5.553 | 3.367 |
| 0.967741935483871 | 2.868 | 2.855 | 2.807 | 2.726 | 2.682 | 0.9017 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 0.1 | 32.834 | 32.831 | 32.793 | 32.708 | 32.632 | 31.064 |

Average of yearly averages: 22.7452566666667

Inputs generated by pe5.pl - Novemeber 2006

Data used for this run:
Output File: PAturf
Metfile:w14751.dvf
PRZM scenario: PAturfSTD.txt
EXAMS environment file: pond298.exv
Chemical Name: Myclobutanil

| Description | Variable Name | Value | Units | Comments |
|---|---|---|---|---|
| Molecular weight | mwt | 288.8 | g/mol | |
| Henry's Law Const. | henry | 2.6e-8 | atm-m^3/mol | |
| Vapor Pressure | vapr | 9.75e-6 | torr | |
| Solubility | sol | 142 | mg/L | |
| Kd Kd | 5.03 | mg/L | | |
| Koc Koc | | mg/L | | |
| Photolysis half-life | kdp | 0 | days | Half-life |
| Aerobic Aquatic Metabolism | kbacw | 1283.48 | days | Halfife |
| Anaerobic Aquatic Metabolism | kbacs | 0 | days | Halfife |
| Aerobic Soil Metabolism | asm | 251 | days | Halfife |
| Hydrolysis: pH 7 | 0 | days | Half-life | |
| Method: CAM | 2 | integer | See PRZM manual | |
| Incorporation Depth: | DEPI | 4 | cm | |
| Application Rate: | TAPP | 0.224 | kg/ha | |
| Application Efficiency: | APPEFF | 0.95 | fraction | |
| Spray Drift DRFT | 0.05 | fraction of application rate applied to pond | | |
| Application Date | Date | 15-8 | dd/mm or dd/mmm or dd-mm or dd-mmm | |
| Interval 1 | interval | 14 | days | Set to 0 or delete line for single app. |
| app. rate 1 | apprate | 0.224 | kg/ha | |
| Interval 2 | interval | 14 | days | Set to 0 or delete line for single app. |
| app. rate 2 | apprate | 0.224 | kg/ha | |
| Interval 3 | interval | 14 | days | Set to 0 or delete line for single app. |
| app. rate 3 | apprate | 0.224 | kg/ha | |
| Record 17: FILTRA | | | | |
| IPSCND | 1 | | | |
| UPTKF | | | | |
| Record 18: PLVKRT | | | | |
| PLDKRT | | | | |
| FEXTRC | 0.5 | | | |
| Flag for Index Res. Run | IR | EPA Pond | | |
| Flag for runoff calc. | RUNOFF | none | none, monthly or total(average of entire run) | |

**1,2,4-Triazole**

stored as PA124T.out
Chemical: 124triazole
PRZM environment: PAturfSTD.txt modified Thuday, 23 February 2006 at 17:55:08
EXAMS environment: pond298.exv modified Tueday, 26 August 2008 at 05:14:08

Metfile: w14751.dvf modified Tueday, 26 August 2008 at 05:15:00
Water segment concentrations (ppb)

| Year | Peak | 96 hr | 21 Day | 60 Day | 90 Day | Yearly |
|---|---|---|---|---|---|---|
| 1961 | 0.1082 | 0.107 | 0.1022 | 0.0938 | 0.08896 | 0.02976 |
| 1962 | 0.1427 | 0.1412 | 0.1351 | 0.1229 | 0.1159 | 0.06351 |
| 1963 | 0.138 | 0.1365 | 0.1306 | 0.1198 | 0.1126 | 0.07325 |
| 1964 | 0.1341 | 0.1327 | 0.127 | 0.1181 | 0.1119 | 0.07197 |
| 1965 | 0.1186 | 0.1174 | 0.1127 | 0.106 | 0.1009 | 0.06656 |
| 1966 | 0.4146 | 0.4099 | 0.4017 | 0.3726 | 0.3486 | 0.1349 |
| 1967 | 0.2565 | 0.2542 | 0.2445 | 0.2244 | 0.2104 | 0.1466 |
| 1968 | 0.1774 | 0.1754 | 0.1678 | 0.1579 | 0.1492 | 0.08847 |
| 1969 | 0.1185 | 0.1173 | 0.1148 | 0.1059 | 0.1007 | 0.07698 |
| 1970 | 0.109 | 0.1078 | 0.103 | 0.09606 | 0.09195 | 0.06078 |
| 1971 | 0.1373 | 0.1358 | 0.1298 | 0.1206 | 0.1146 | 0.06617 |
| 1972 | 0.1159 | 0.1147 | 0.1097 | 0.1013 | 0.09694 | 0.06577 |
| 1973 | 0.4902 | 0.4846 | 0.4724 | 0.4364 | 0.4087 | 0.1506 |
| 1974 | 0.3008 | 0.2981 | 0.2867 | 0.2631 | 0.2466 | 0.1839 |
| 1975 | 0.4186 | 0.414 | 0.3957 | 0.3588 | 0.3345 | 0.1539 |
| 1976 | 0.2579 | 0.2555 | 0.2459 | 0.2255 | 0.2113 | 0.1588 |
| 1977 | 0.135 | 0.1338 | 0.1288 | 0.1183 | 0.1109 | 0.08904 |
| 1978 | 0.1109 | 0.1097 | 0.1051 | 0.0967 | 0.09183 | 0.06291 |
| 1979 | 0.193 | 0.191 | 0.1848 | 0.1708 | 0.1604 | 0.07828 |
| 1980 | 0.1589 | 0.1573 | 0.1509 | 0.1378 | 0.1294 | 0.09035 |
| 1981 | 0.1199 | 0.1186 | 0.1136 | 0.1053 | 0.1002 | 0.07855 |
| 1982 | 0.1098 | 0.1086 | 0.104 | 0.09564 | 0.09107 | 0.06043 |
| 1983 | 0.1075 | 0.1063 | 0.1018 | 0.09363 | 0.08909 | 0.05685 |
| 1984 | 0.1071 | 0.106 | 0.1013 | 0.09279 | 0.08808 | 0.05592 |
| 1985 | 0.2056 | 0.2033 | 0.1944 | 0.1765 | 0.1647 | 0.07607 |
| 1986 | 0.128 | 0.1268 | 0.122 | 0.112 | 0.105 | 0.08446 |
| 1987 | 0.1567 | 0.155 | 0.1484 | 0.1391 | 0.1323 | 0.07296 |
| 1988 | 0.1156 | 0.1144 | 0.1095 | 0.1014 | 0.09645 | 0.07143 |
| 1989 | 0.1589 | 0.1572 | 0.1504 | 0.1415 | 0.1351 | 0.07529 |
| 1990 | 0.1249 | 0.1235 | 0.1185 | 0.1107 | 0.1054 | 0.07497 |

Sorted results

| Prob. | Peak | 96 hr | 21 Day | 60 Day | 90 Day | Yearly |
|---|---|---|---|---|---|---|
| 0.032258064516129 | 0.4902 | 0.4846 | 0.4724 | 0.4364 | 0.4087 | 0.1839 |
| 0.0645161290322581 | 0.4186 | 0.414 | 0.4017 | 0.3726 | 0.3486 | 0.1588 |
| 0.0967741935483871 | 0.4146 | 0.4099 | 0.3957 | 0.3588 | 0.3345 | 0.1539 |
| 0.129032258064516 | 0.3008 | 0.2981 | 0.2867 | 0.2631 | 0.2466 | 0.1506 |
| 0.161290322580645 | 0.2579 | 0.2555 | 0.2459 | 0.2255 | 0.2113 | 0.1466 |
| 0.193548387096774 | 0.2565 | 0.2542 | 0.2445 | 0.2244 | 0.2104 | 0.1349 |
| 0.225806451612903 | 0.2056 | 0.2033 | 0.1944 | 0.1765 | 0.1647 | 0.09035 |
| 0.258064516129032 | 0.193 | 0.191 | 0.1848 | 0.1708 | 0.1604 | 0.08904 |
| 0.290322580645161 | 0.1774 | 0.1754 | 0.1678 | 0.1579 | 0.1492 | 0.08847 |
| 0.32258064516129 | 0.1589 | 0.1573 | 0.1509 | 0.1415 | 0.1351 | 0.08446 |
| 0.354838709677419 | 0.1589 | 0.1572 | 0.1504 | 0.1391 | 0.1323 | 0.07855 |
| 0.387096774193548 | 0.1567 | 0.155 | 0.1484 | 0.1378 | 0.1294 | 0.07828 |
| 0.419354838709677 | 0.1427 | 0.1412 | 0.1351 | 0.1229 | 0.1159 | 0.07698 |
| 0.451612903225806 | 0.138 | 0.1365 | 0.1306 | 0.1206 | 0.1146 | 0.07607 |
| 0.483870967741936 | 0.1373 | 0.1358 | 0.1298 | 0.1198 | 0.1126 | 0.07529 |
| 0.516129032258065 | 0.135 | 0.1338 | 0.1288 | 0.1183 | 0.1119 | 0.07497 |
| 0.548387096774194 | 0.1341 | 0.1327 | 0.127 | 0.1181 | 0.1109 | 0.07325 |
| 0.580645161290323 | 0.128 | 0.1268 | 0.122 | 0.112 | 0.1054 | 0.07296 |
| 0.612903225806452 | 0.1249 | 0.1235 | 0.1185 | 0.1107 | 0.105 | 0.07197 |
| 0.645161290322581 | 0.1199 | 0.1186 | 0.1148 | 0.106 | 0.1009 | 0.07143 |
| 0.67741935483871 | 0.1186 | 0.1174 | 0.1136 | 0.1059 | 0.1007 | 0.06656 |
| 0.709677419354839 | 0.1185 | 0.1173 | 0.1127 | 0.1053 | 0.1002 | 0.06617 |
| 0.741935483870968 | 0.1159 | 0.1147 | 0.1097 | 0.1014 | 0.09694 | 0.06577 |
| 0.774193548387097 | 0.1156 | 0.1144 | 0.1095 | 0.1013 | 0.09645 | 0.06351 |
| 0.806451612903226 | 0.1109 | 0.1097 | 0.1051 | 0.0967 | 0.09195 | 0.06291 |
| 0.838709677419355 | 0.1098 | 0.1086 | 0.104 | 0.09606 | 0.09183 | 0.06078 |
| 0.870967741935484 | 0.109 | 0.1078 | 0.103 | 0.09564 | 0.09107 | 0.06043 |

0.903225806451613 0.1082 0.107 0.1022 0.0938 0.089090.05685
0.935483870967742 0.1075 0.1063 0.1018 0.093630.088960.05592
0.967741935483871 0.1071 0.106 0.1013 0.092790.088080.02976

0.1 0.403220.398720.3848 0.349230.325710.15357
Average of yearly averages: 0.0873143333333333

Inputs generated by pe5.pl - Novemeber 2006

Data used for this run:
Output File: PA124T
Metfile:w14751.dvf
PRZM scenario: PAturfSTD.txt
EXAMS environment file: pond298.exv
Chemical Name: 124triazole

| Description | Variable Name | Value | Units | Comments |
|---|---|---|---|---|
| Molecular weight | mwt | 69.07 | g/mol | |
| Henry's Law Const. | henry | 1.97e-10 | | atm-m^3/mol |
| Vapor Pressure | vapr | 1.65e-3 | torr | |
| Solubility | sol | 7000000 | mg/L | |
| Kd Kd | 0.75 | mg/L | | |
| Koc Koc | | mg/L | | |
| Photolysis half-life | kdp | 0 | days | Half-life |
| Aerobic Aquatic Metabolism | kbacw | 500 | days | Halfife |
| Anaerobic Aquatic Metabolism | kbacs | 0 | days | Halfife |
| Aerobic Soil Metabolism | asm | 250 | days | Halfife |
| Hydrolysis: pH 7 | 161 | days | Half-life | |
| Method: CAM | 2 | integer | See PRZM manual | |
| Incorporation Depth: | DEPI | 4 | cm | |
| Application Rate: | TAPP | 0.010 | kg/ha | |
| Application Efficiency: | APPEFF | 0.95 | fraction | |
| Spray Drift DRFT | 0.05 | fraction of application rate applied to pond | | |
| Application Date | Date | 15-8 | dd/mm or dd/mmm or dd-mm or dd-mmm | |
| Interval 1 | interval | 14 | days | Set to 0 or delete line for single app. |
| app. rate 1 | apprate | 0.010 | kg/ha | |
| Interval 2 | interval | 14 | days | Set to 0 or delete line for single app. |
| app. rate 2 | apprate | 0.010 | kg/ha | |
| Interval 3 | interval | 14 | days | Set to 0 or delete line for single app. |
| app. rate 3 | apprate | 0.010 | kg/ha | |
| Record 17: FILTRA | | | | |
| IPSCND | 1 | | | |
| UPTKF | | | | |
| Record 18: PLVKRT | | | | |
| PLDKRT | | | | |
| FEXTRC | 0.5 | | | |
| Flag for Index Res. Run | IR | EPA Pond | | |
| Flag for runoff calc. | RUNOFF | none | none, monthly or total(average of entire run) | |

## Appendix D. TREX Input Parameters

| Chemical Identity and Application Information | |
|---|---|
| Chemical Name: | |
| Seed Treatment? | |
| Use: | |
| Product name and form: | |
| % A.I. (leading zero must be entered for formulations <1% a.i.): | |
| Application Rate (lb ai/acre) | |
| Half-life (days): | |
| Application Interval (days): | |
| Number of Applications: | |
| Are you assessing applications with variable rates or intervals? | |

| Avian | | | |
|---|---|---|---|
| Endpoint | Toxicity value | Indicate if test species is bobwhite or mallard | |
| LD50 (mg/kg-bw) | | | |
| LC50 (mg/kg-diet) | | | |
| | NOAEL (mg/kg-bw) | | |
| NOAEC (mg/kg-diet) | | | |
| Enter the Mineau et al. Scaling Factor | | 1.15 | |
| **Mammalian** | | | |
| | | Acute Study | Chronic Study |
| Size (g) of mammal used in toxicity study Default rat body weight is 350 grams | | | |
| Endpoint | Toxicity value | | |
| LD50 (mg/kg-bw) | | | |
| | LC50 (mg/kg-diet) | | |
| Reported Chronic Endpoint | | | |
| Is estimated daily dose (mg/kg-bw) reported from the available chronic mammal study? (yes or no) | | | |
| Enter daily dose (mg/kg-bw) | | | |